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ID VALÈNCIA

[ϕ] Facultat de Física



Dijous 30 d'octubre del 2014, 12:30 hores
Saló d'Actes de la Biblioteca de Ciències "Eduard Boscà"
Campus de Burjassot

Estudi de contaminació d'aigües per mitjà de teledetecció



Prof. José Antonio Domínguez Gómez
Departament de Física Matemàtica i de Fluids,
Universitat Nacional d'Educació a Distància (UNED)

[ϕ] Facultat de Física

Estudio de Contaminación de Aguas mediante Teledetección

Dr. Jose Antonio Domínguez Gómez (jadomin@dfmf.uned.es)

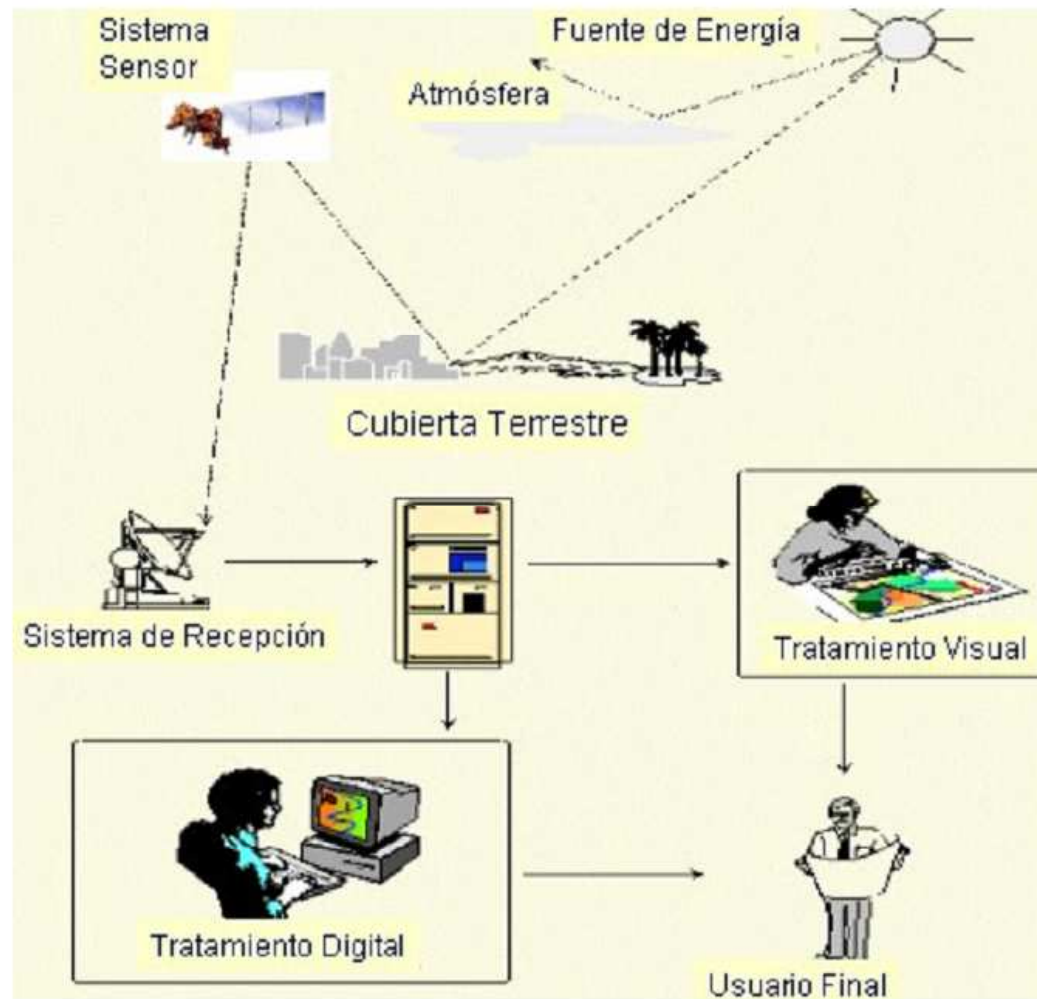
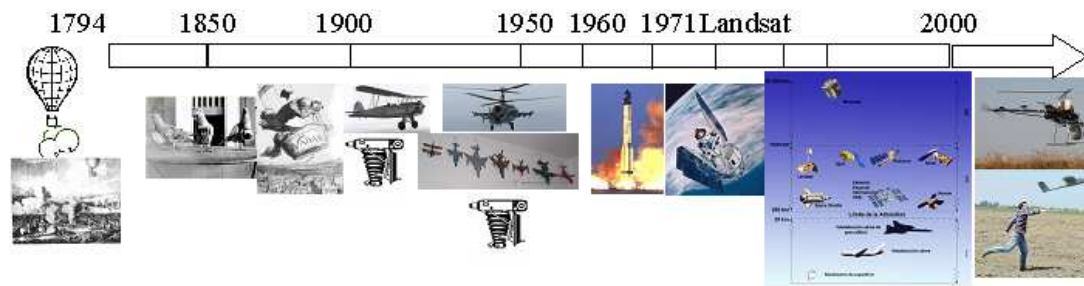
Dpto de Física Matemática y de Fluidos. Facultad de Ciencias, UNED,
Coordinador del Grupo Temático de Limnología y Aguas Continentales de la Asociación
Española de Teledetección



- 1.- INTRODUCCIÓN A LA TELEDETECCIÓN
- 2.- DIFERENCIAS DE LA TELEDETECCIÓN TERRESTRE Y ACUÁTICA
- 3.- PROPIEDADES ÓPTICAS DEL AGUA
- 4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS
- 5.-CONTAMINACIÓN DE AGUAS MEDIANTE TELEDETECCIÓN
- 6.- CONCLUSIÓN



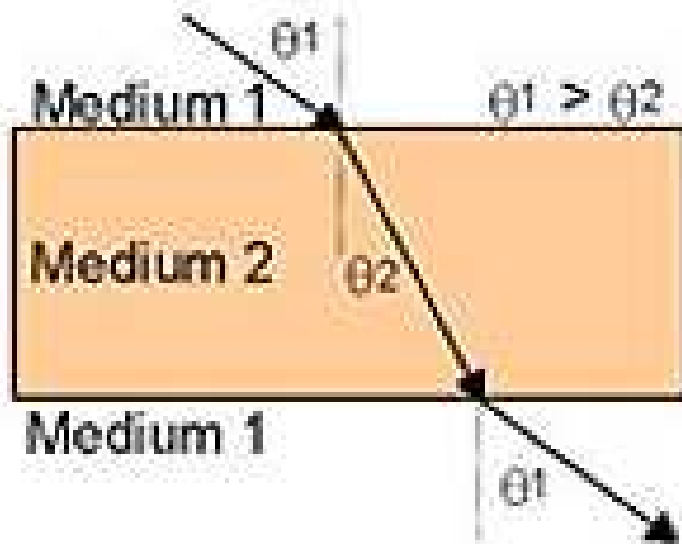
1.- INTRODUCCIÓN A LA TELEDETECCIÓN



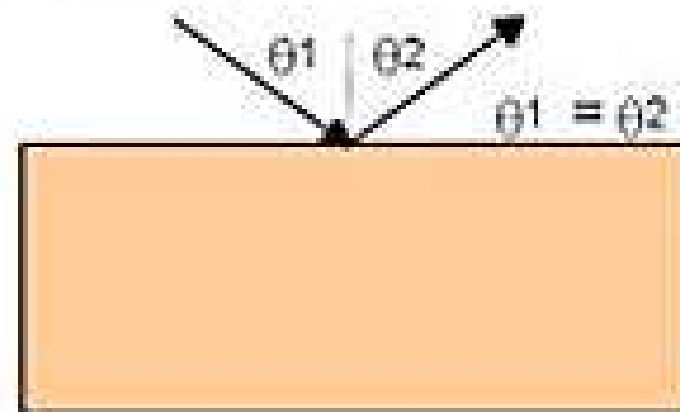
TELEDETECCIÓN

1.- INTRODUCCIÓN A LA TELEDETECCIÓN

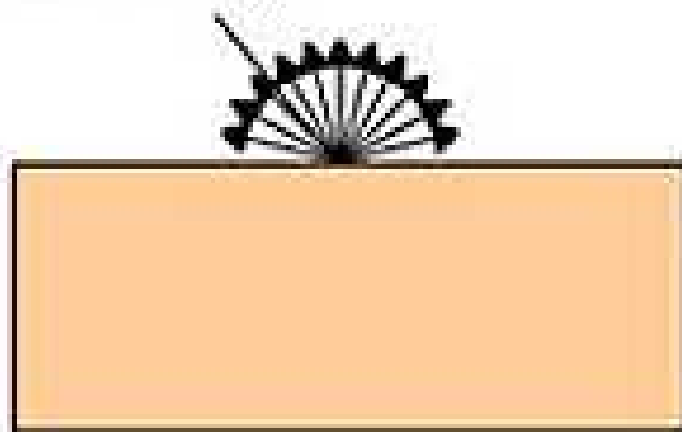
Transmission



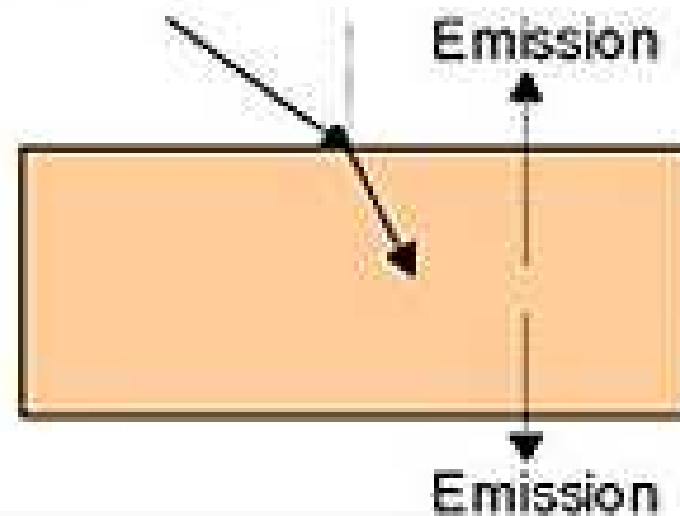
Reflection



Scattering



Absorption



1.- INTRODUCCIÓN A LA TELEDETECCIÓN

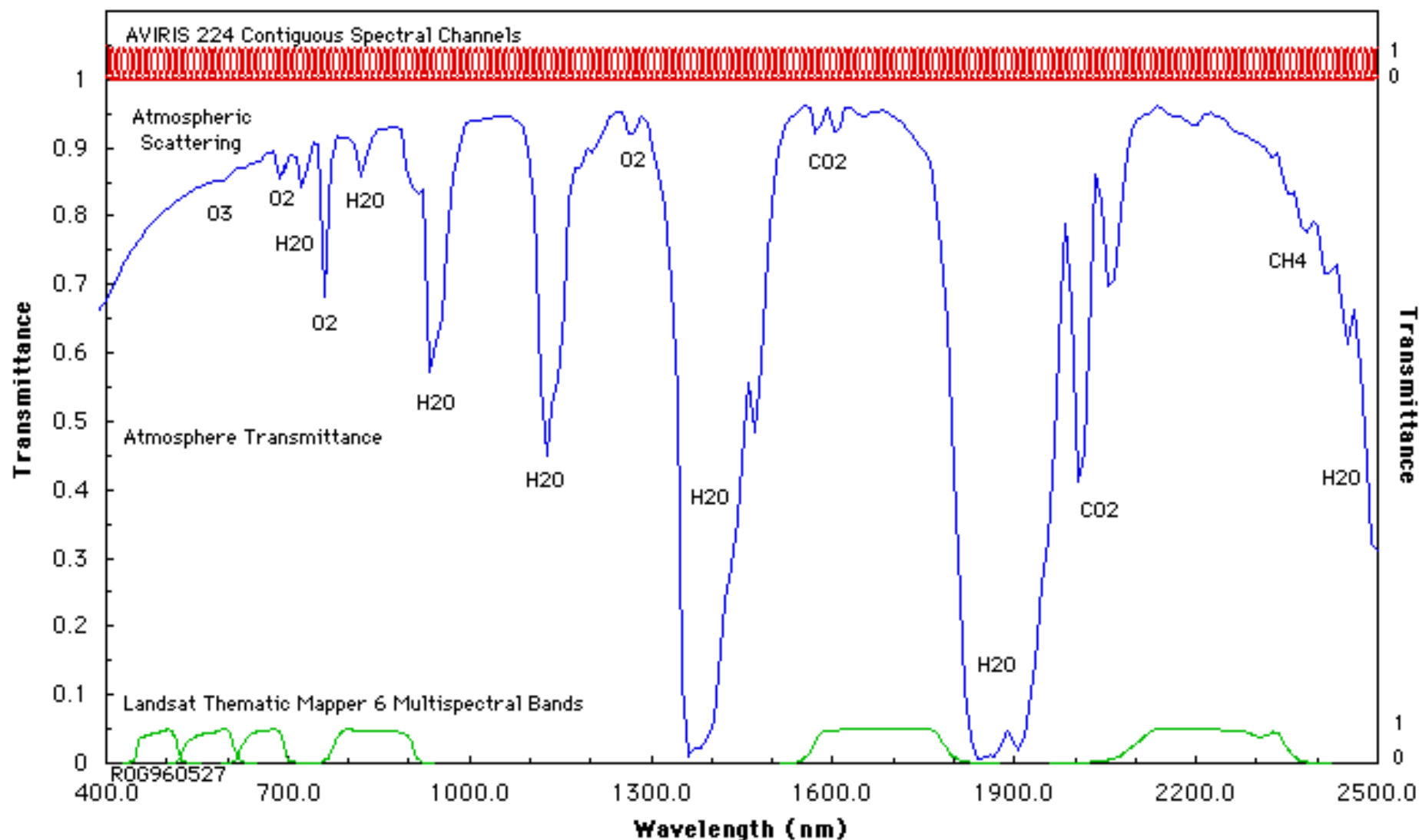


<http://profesor-rafazamora.blogspot.com.es/2011/11/lo-grande-y-lo-pequeno.html>

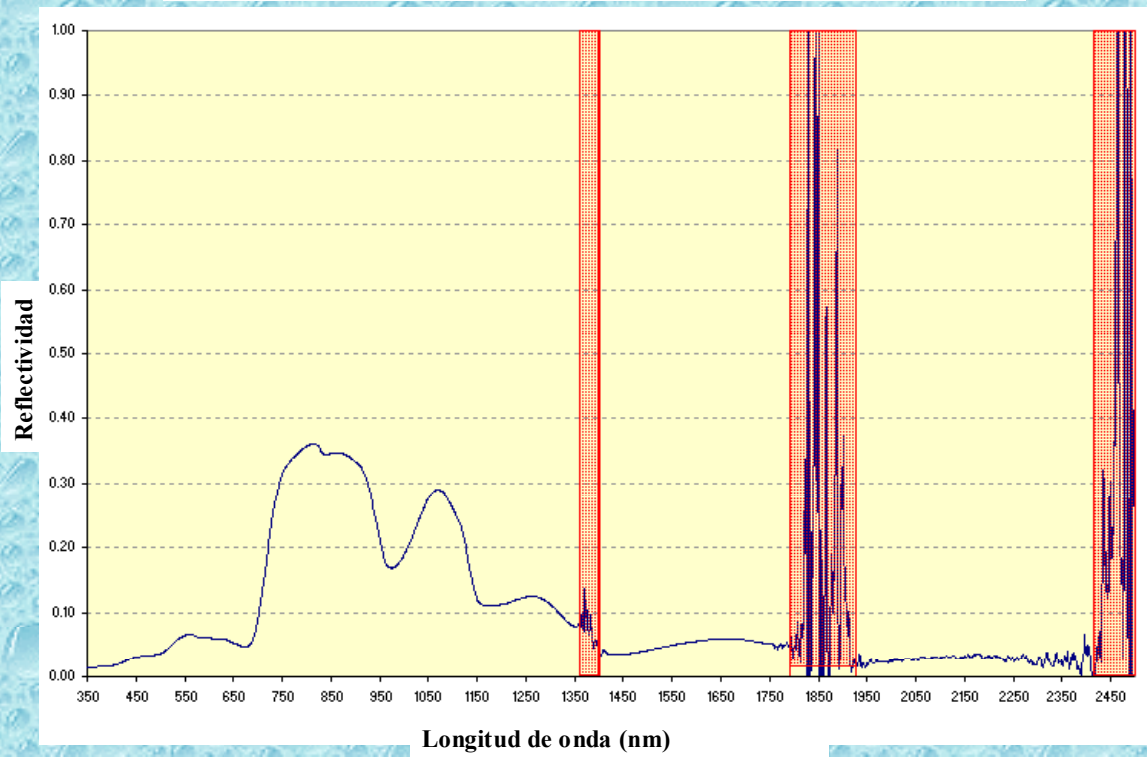
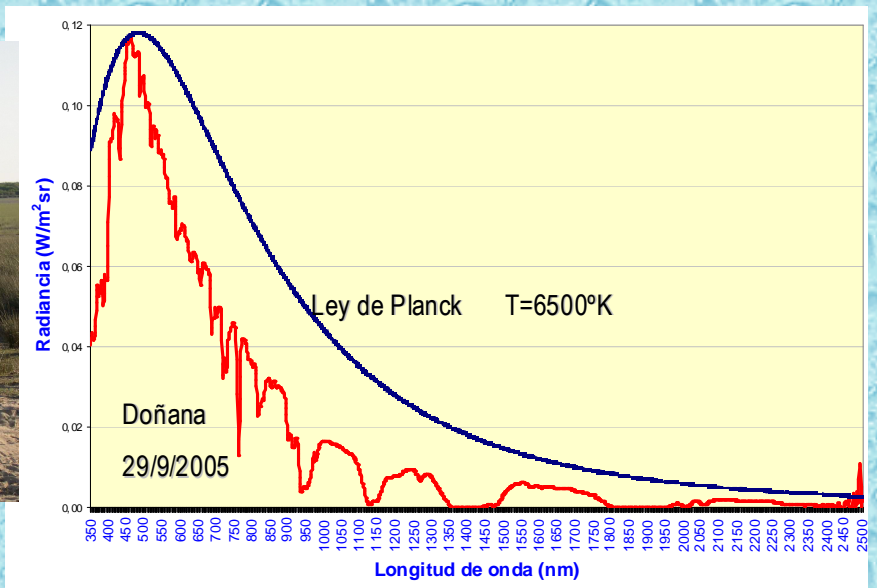
1.- INTRODUCCIÓN A LA TELEDETECCIÓN



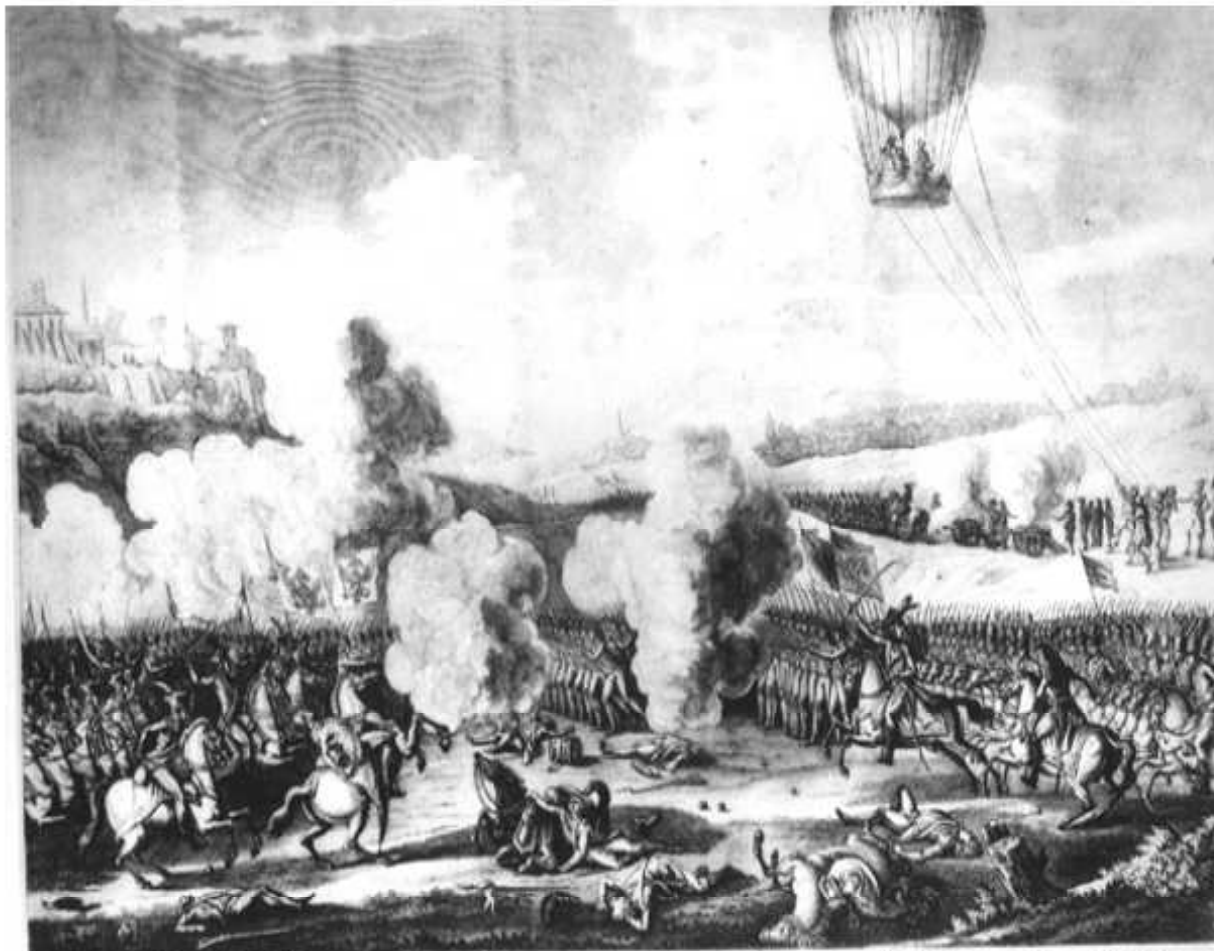
AVIRIS Measurements in the Solar Reflected Spectrum .



1.- INTRODUCCIÓN A LA TELEDETECCIÓN



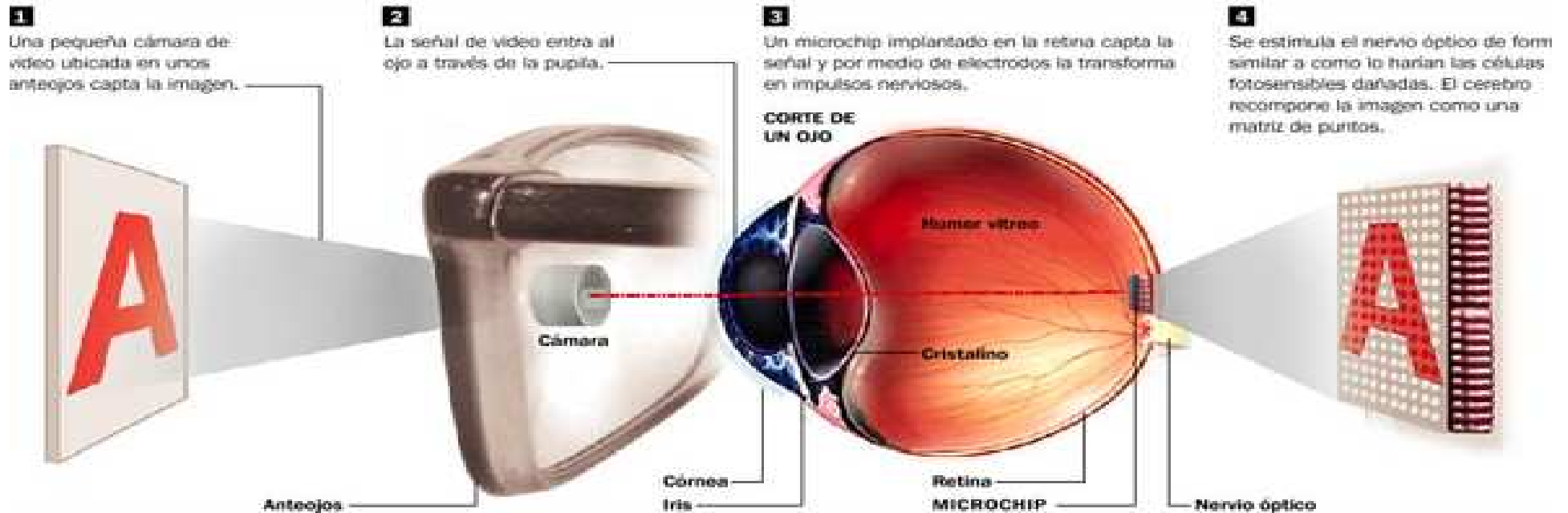
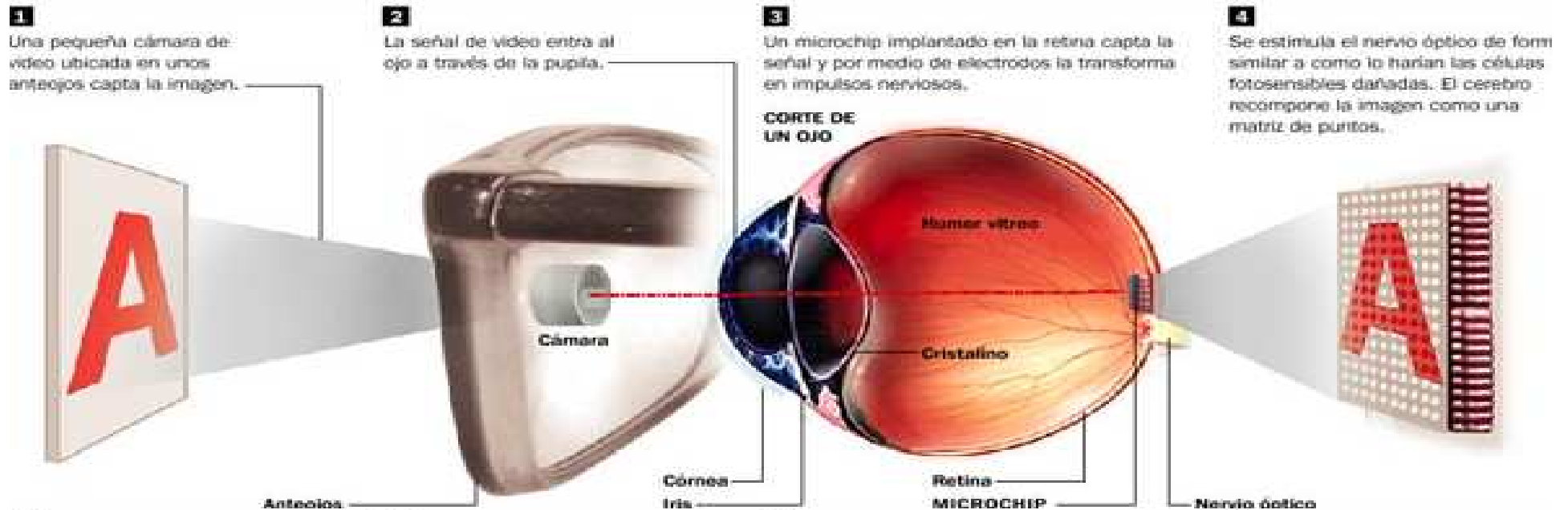
1.- INTRODUCCIÓN A LA TELEDETECCIÓN



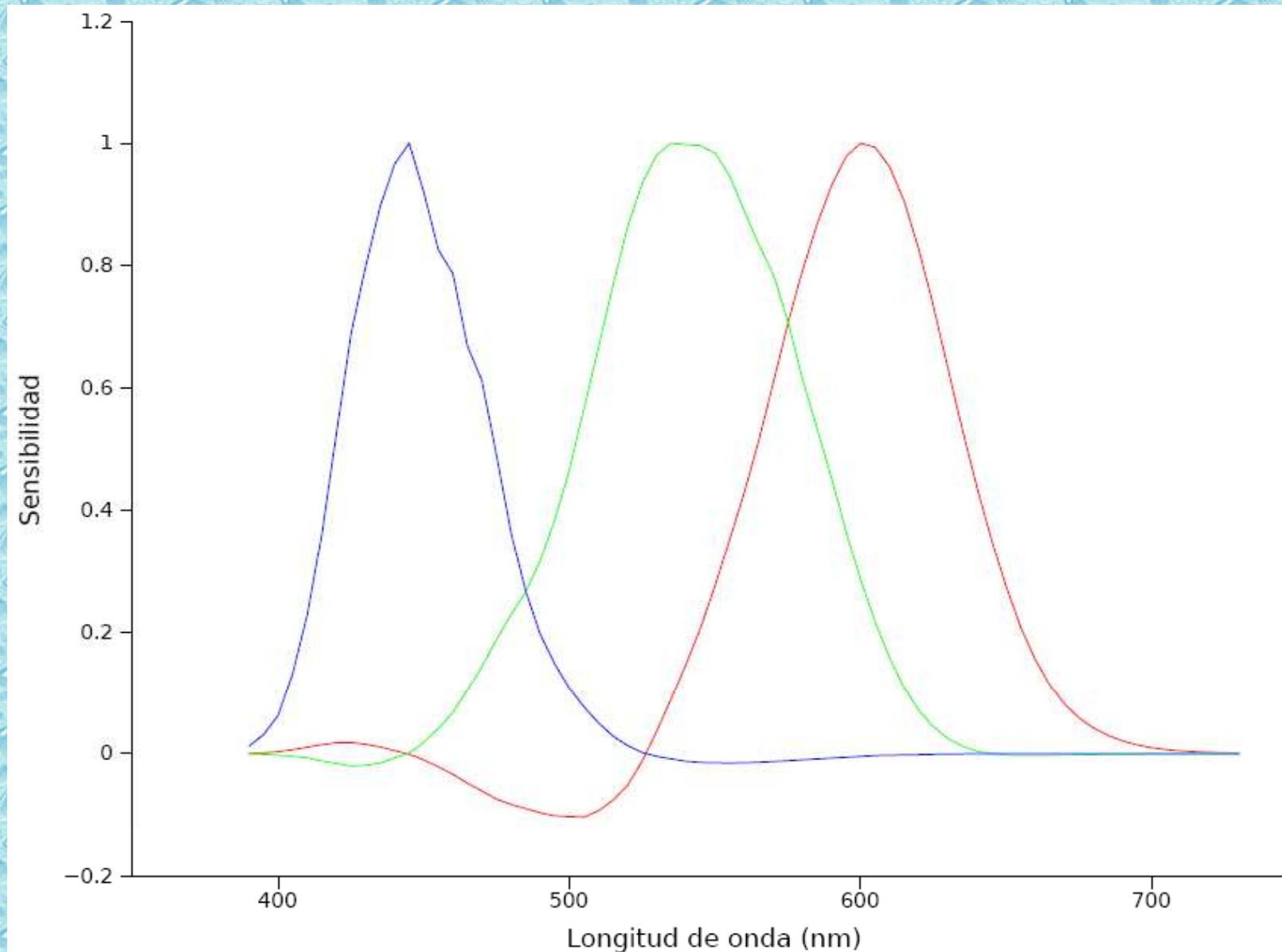
Bataille de Fleurus gagnée par l'Armée Française, le 8 Messidor, de l'An 2.

L'Entreprenant en la Batalla de Fleurus ganada por el Ejército Francés al austríaco el 26 de Junio de 1794 (National Air and Space Museum, Smithsonian Institution, Washington No. 76-1196).

1.- INTRODUCCIÓN A LA TELEDETECCIÓN

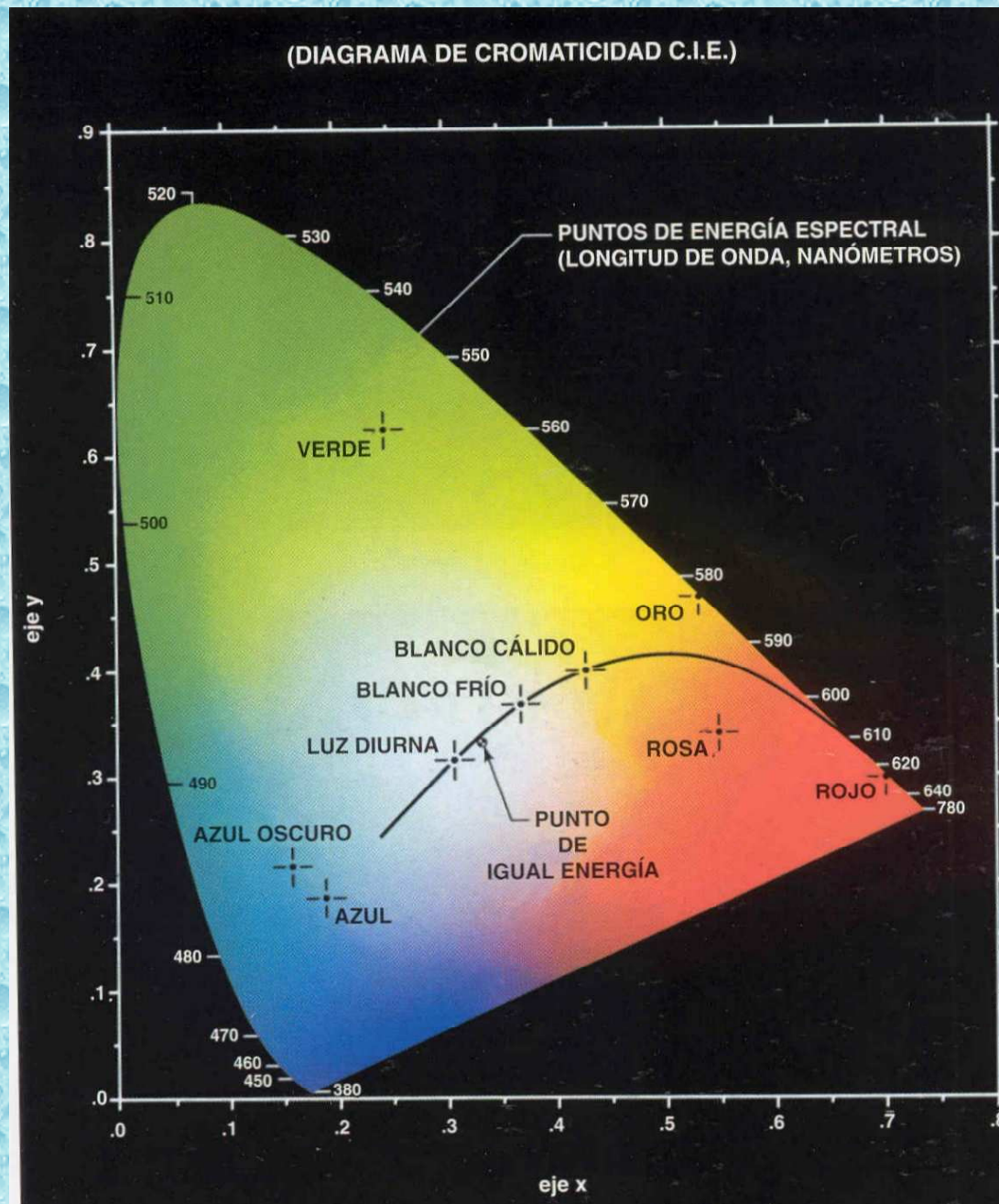


1.- INTRODUCCIÓN A LA TELEDETECCIÓN

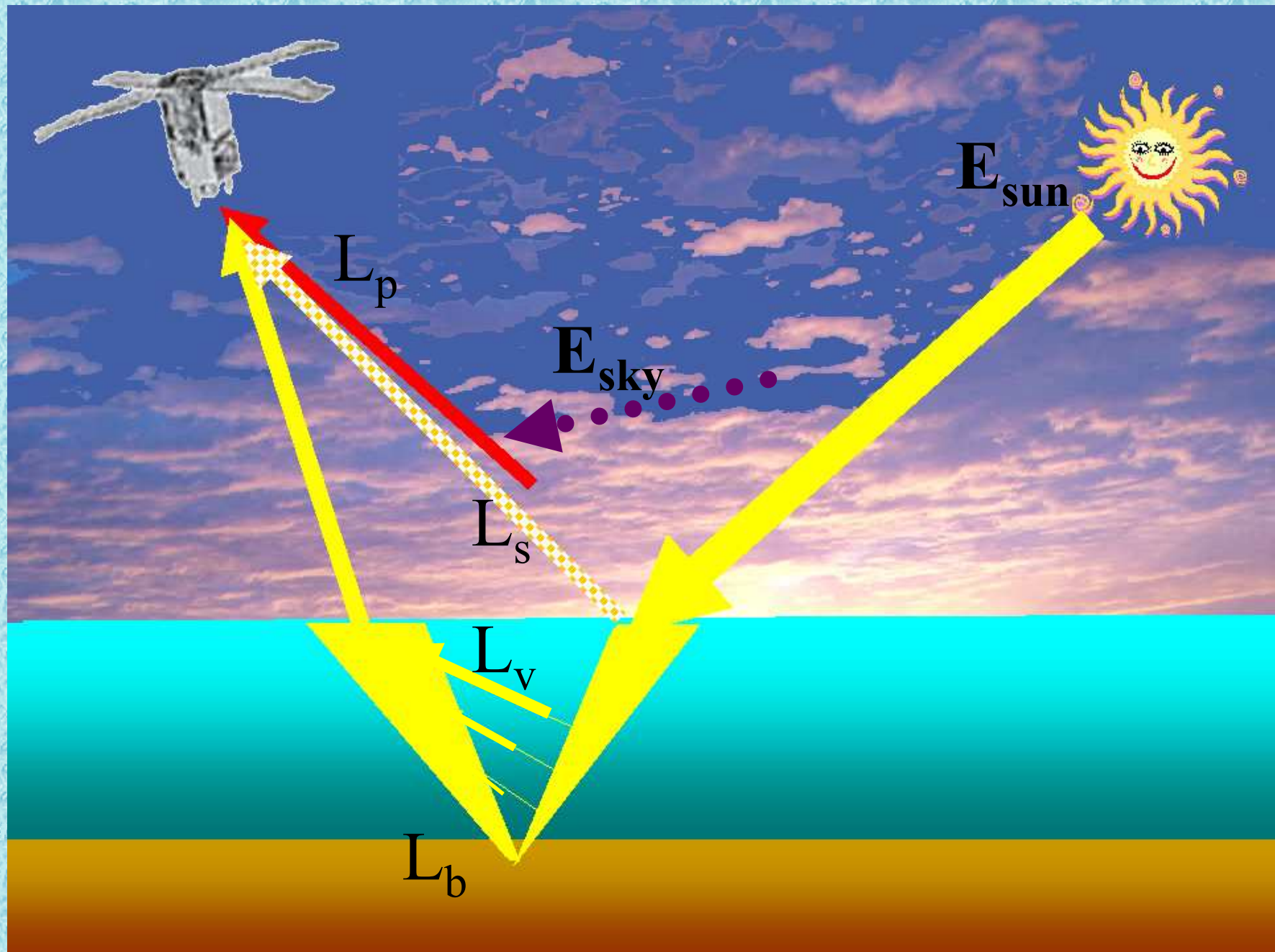


Ventanas espectrales de un ojo estándar (Domínguez 2012)

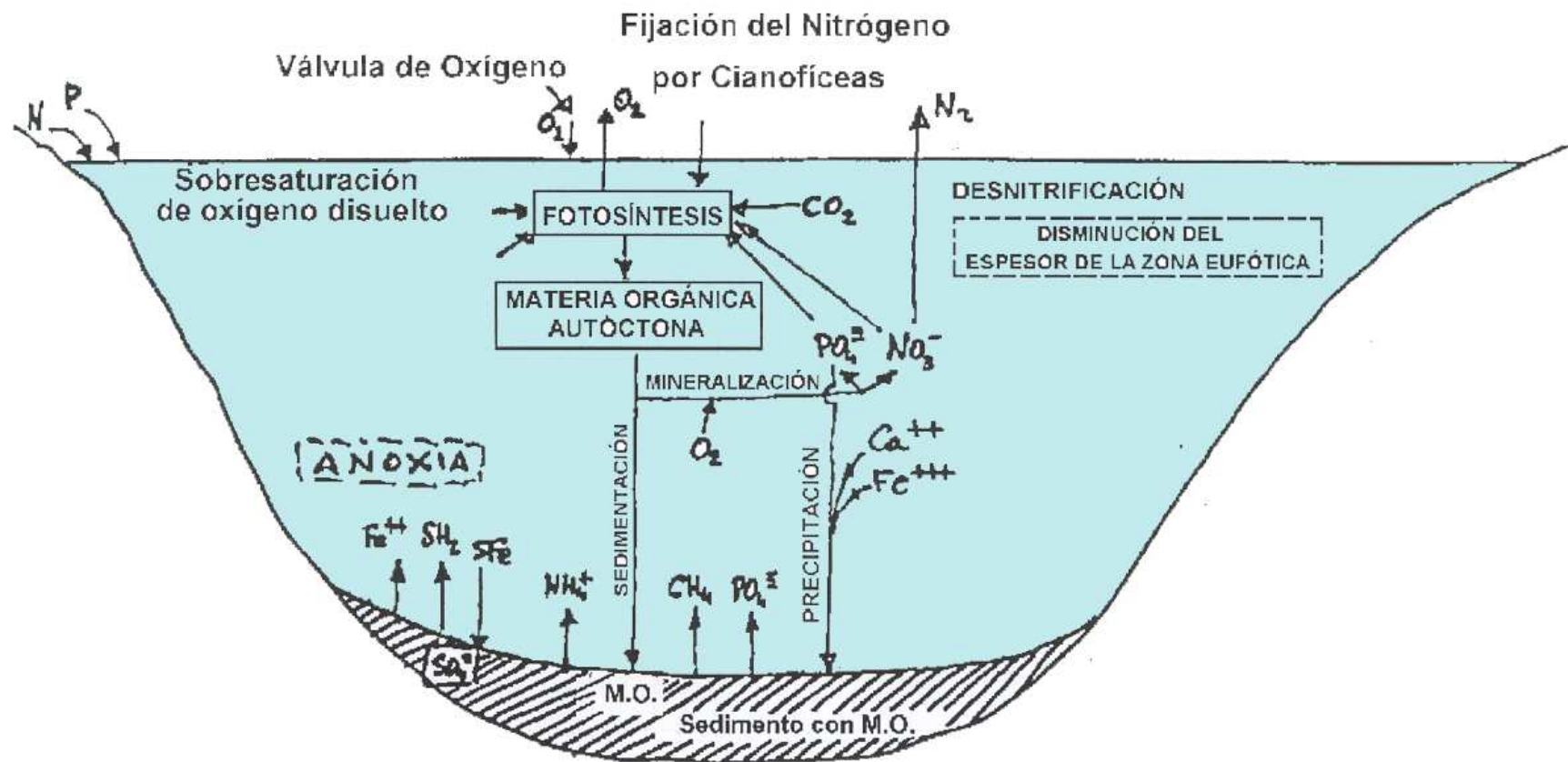
1.- INTRODUCCIÓN A LA TELEDETECCIÓN



2.- DIFERENCIAS DE LA TELEDETECCIÓN TERRESTRE Y ACUÁTICA



2.- DIFERENCIAS DE LA TELEDETECCIÓN TERRESTRE Y ACUÁTICA



M.O. = Materia Orgánica

(Ortiz 1987)

3.- PROPIEDADES ÓPTICAS DEL AGUA

Comportamiento de la Energía en el Agua

Lambert-Beer: $E_d(\lambda, z) = E_d(\lambda, 0^-) \cdot e^{-k_d(\lambda)z}$

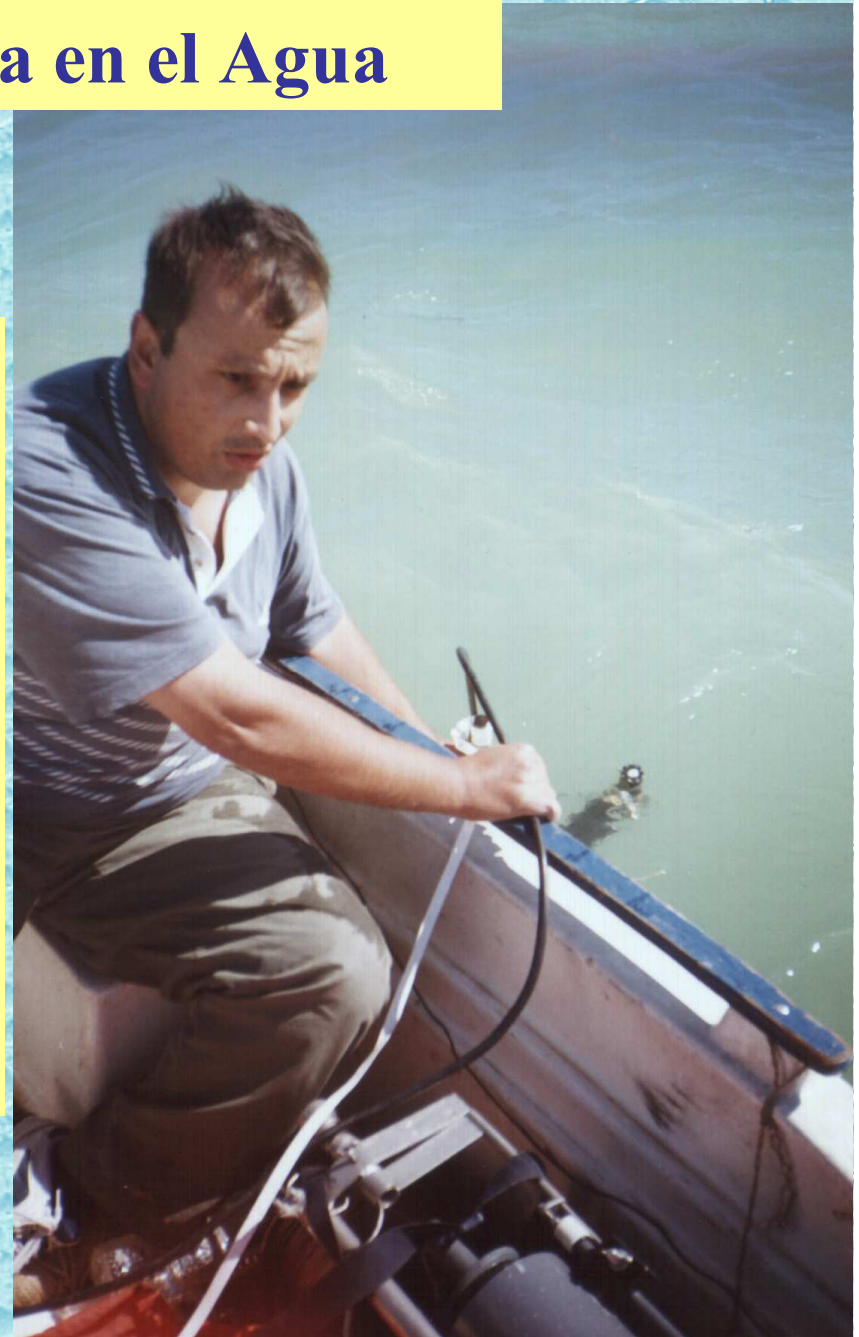
$E_d(\lambda, z)$ Irradiancia incidente a la profundidad z y a la longitud de onda λ .

$E_d(\lambda, 0^-)$ Irradiancia a la superficie interior del agua ($z=0$) y a la longitud de onda λ .

$K_d(\lambda)$ coeficiente de atenuación difusa a la longitud de onda λ . Es la disminución de la irradiancia ambiental en el medio acuático.

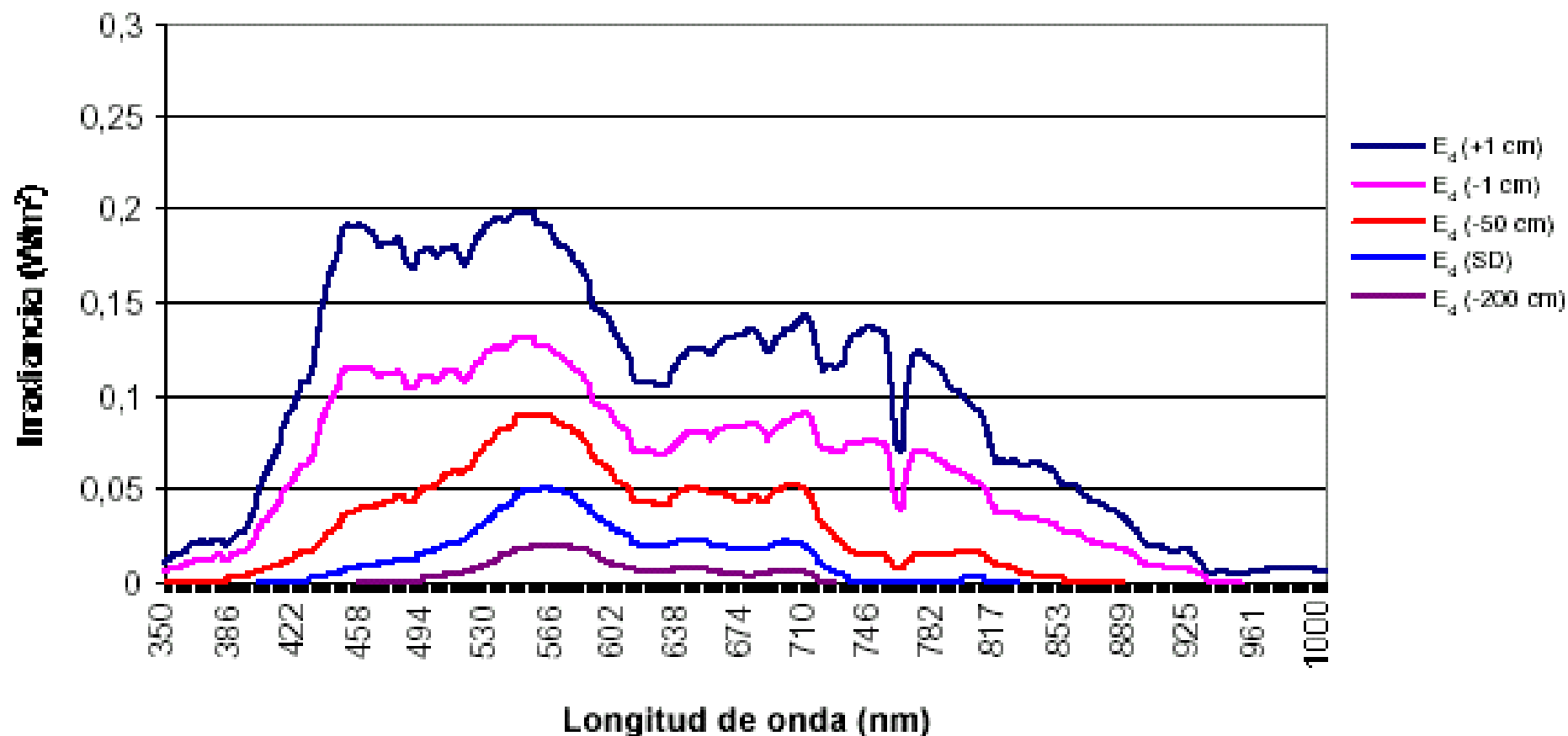
La ley de Lambert-Beer se puede expresar en función del espesor óptico $\zeta = k_d(\lambda)z$

$E_d(\lambda, z) = E_d(\lambda, 0) \cdot e^{-\zeta}$



3.- PROPIEDADES ÓPTICAS DEL AGUA

Comportamiento de la Energía en el Agua

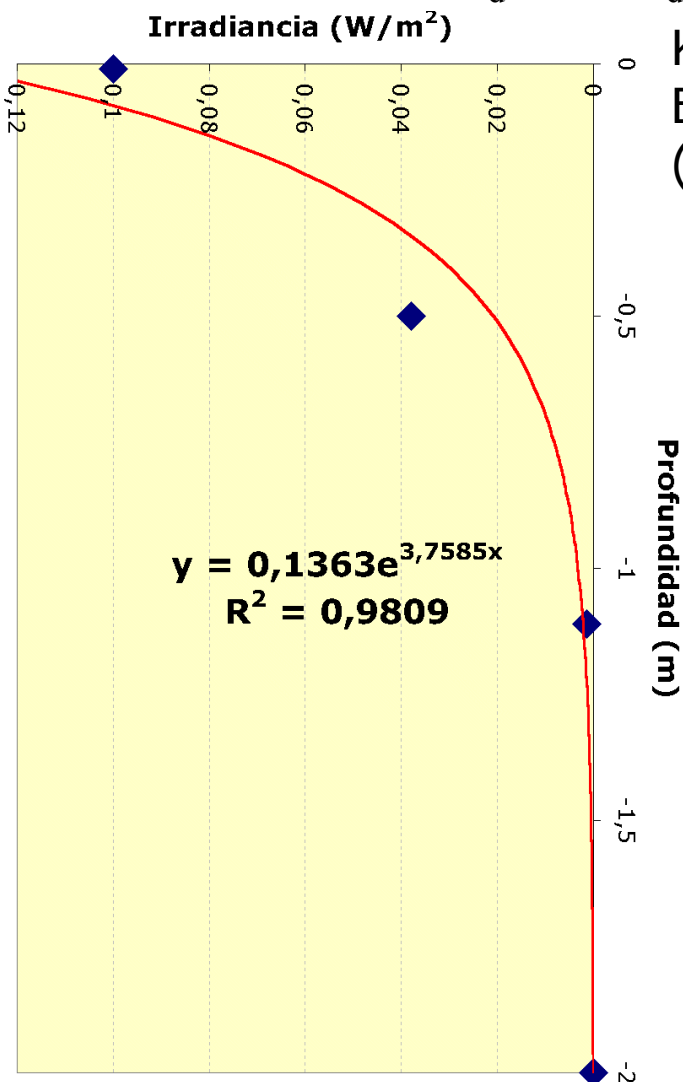


Irradiancia solar en el punto 5 de la laguna de El Campillo (31 de julio de 2000).

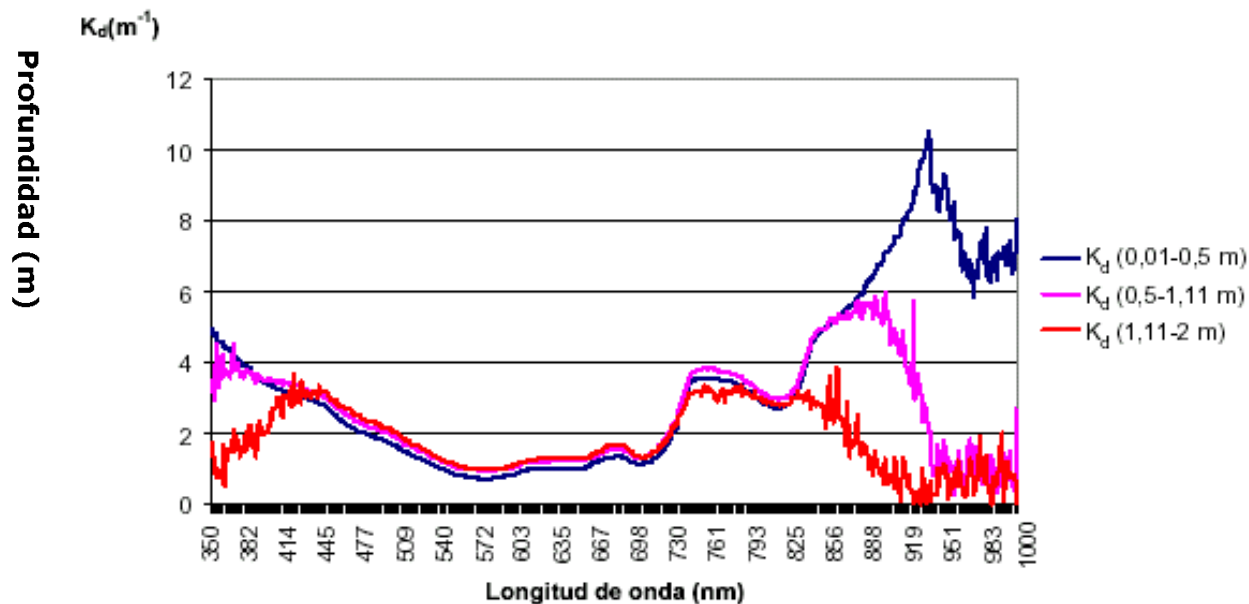
3.- PROPIEDADES ÓPTICAS DEL AGUA

Comportamiento de la Energía en el Agua

Ley Lambert-Beer: $(E_d(\lambda, z) = E_d(\lambda, 0) \exp(-k_d(\lambda)z))$



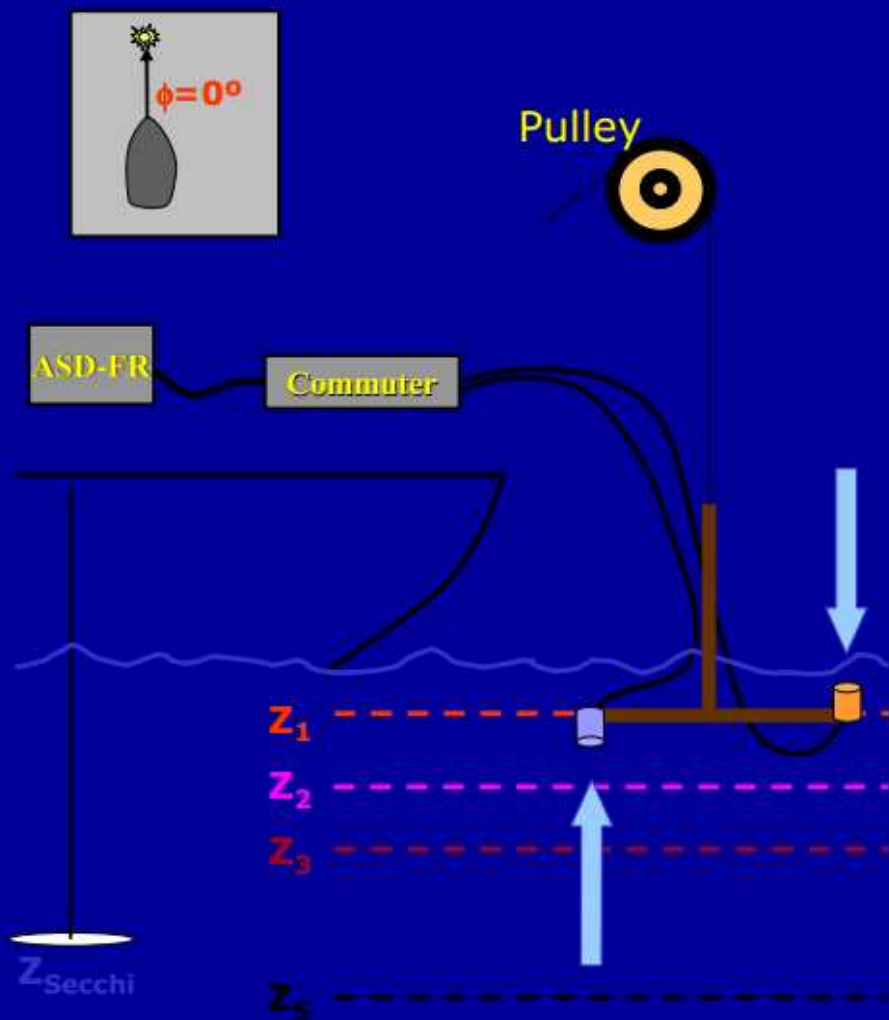
K_d a 430 nm en el punto 5 de la laguna de El Campillo (31 de julio de 2000) (Domínguez, 2002)



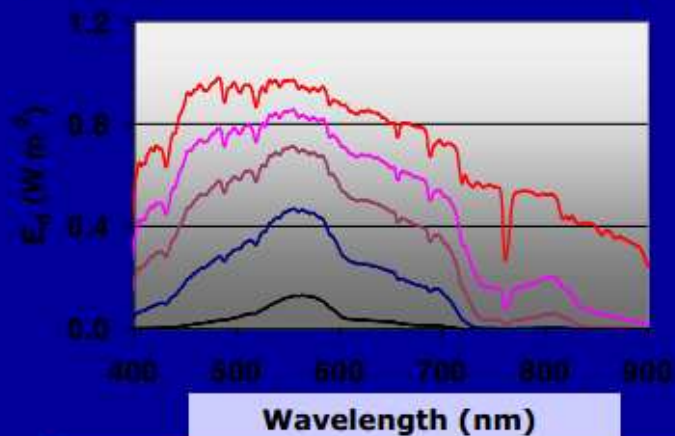
Coefficiente de atenuación vertical difusa incidente en el punto 5 de la laguna El Campillo (31 de julio de 2000).

3.- PROPIEDADES ÓPTICAS DEL AGUA

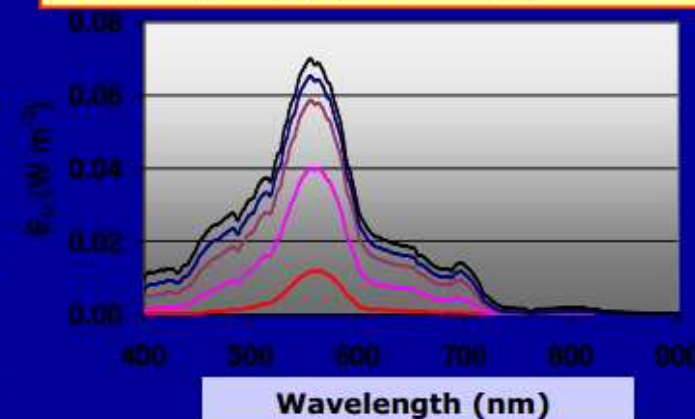
3. RADIOMETRÍA DENTRO DEL AGUA



A) DOWNWELLING Irradiance Attenuation Profile

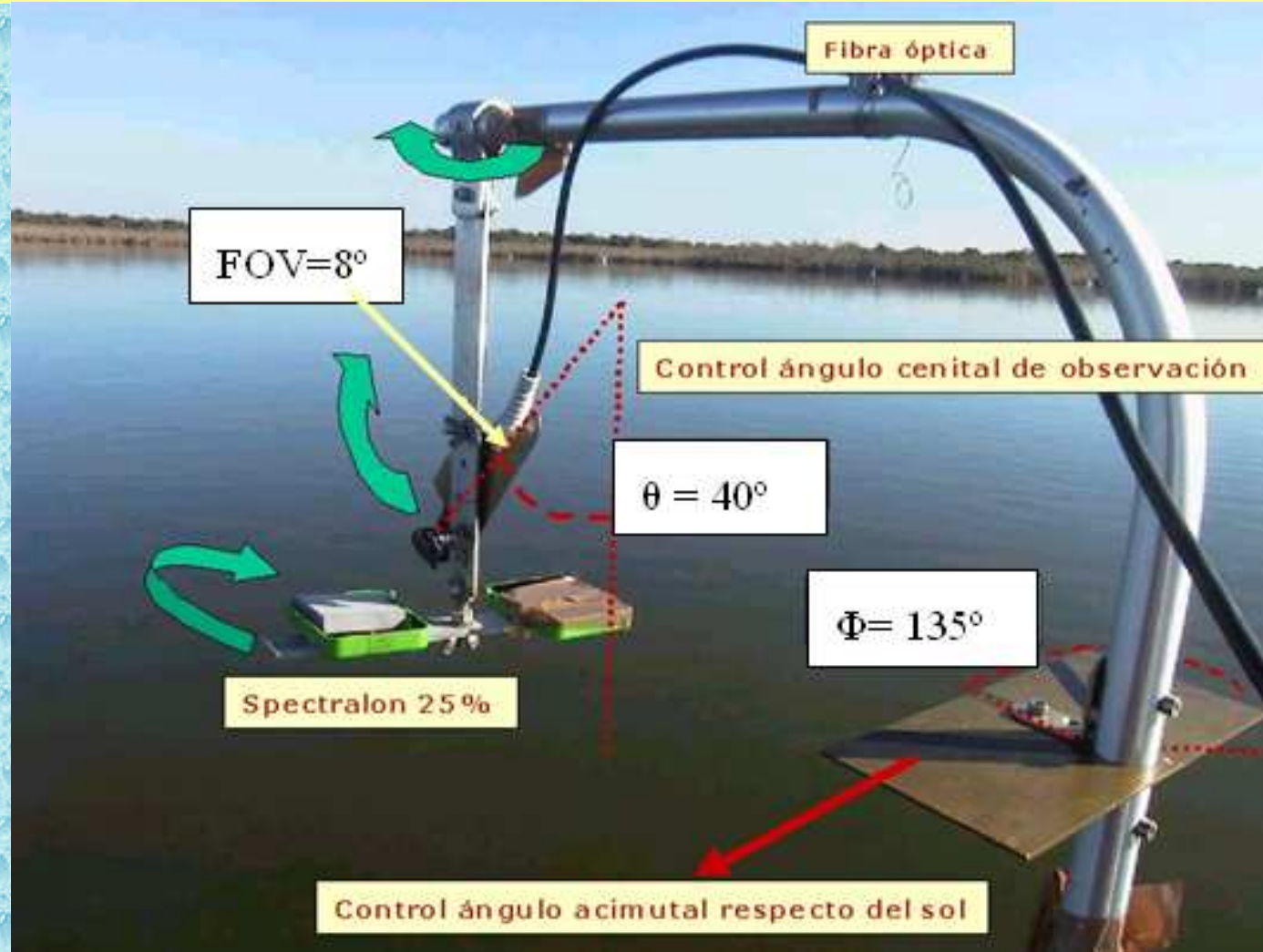


B) UPWELLING Irradiance Attenuation Profile



3.- PROPIEDADES ÓPTICAS DEL AGUA

Comportamiento de la Energía en el Agua



Protocolos NASA (Fargion & Muller 2000)

<http://hercules.cedex.es/Ecosistemas/TeleCongresos/2wCHPa04.pdf>

3.- PROPIEDADES ÓPTICAS DEL AGUA

Comportamiento de la Energía en el Agua

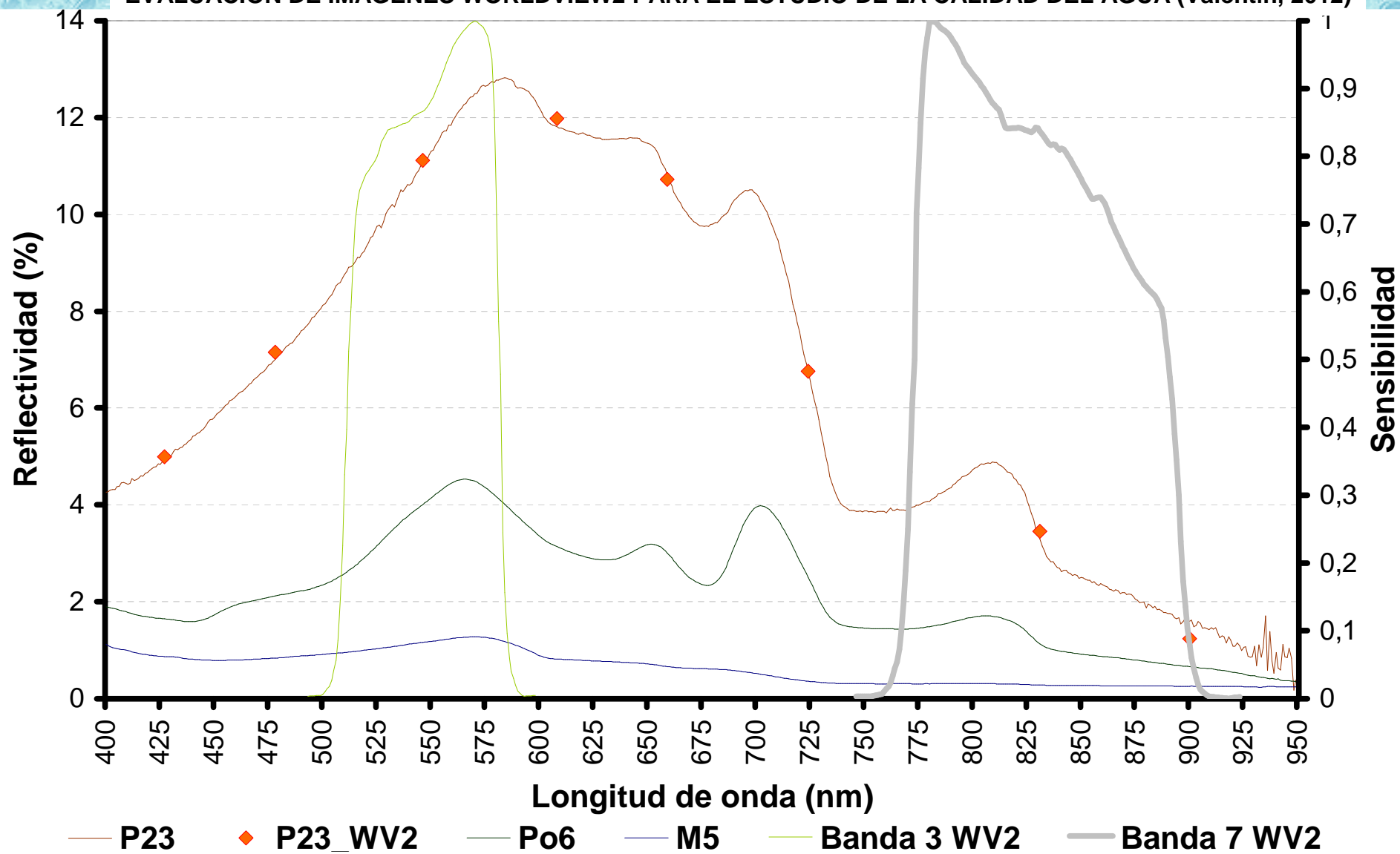


Protocolos NASA (Fargion & Muller 2000)

<http://hercules.cedex.es/Ecosistemas/TeleCongresos/2wCHPa04.pdf>

3.- PROPIEDADES ÓPTICAS DEL AGUA

EVALUACIÓN DE IMÁGENES WORLDVIEW2 PARA EL ESTUDIO DE LA CALIDAD DEL AGUA (Valentín, 2012)



3.- PROPIEDADES ÓPTICAS DEL AGUA

Propiedades Ópticas Inherentes a , b_b , c



3.- PROPIEDADES ÓPTICAS DEL AGUA



Relación entre Propiedades Ópticas Inherentes y Aparentes

Modelo de Simulación de Monte Carlo

$$K_d(z_m) = [a^2 + (0,47\mu_0 - 0,218)ab]^{1/2} / \mu_0 \quad (\text{Kirk 1984})$$

$$R(0^-, \lambda) = r_1 (b_r / b_r + a) \quad (\text{Gordon et al 1975})$$

$$r_1(\mu_0) = -0,629\mu_0 + 0,975 \quad (\text{Kirk 1984})$$

μ_0 es el coseno del ángulo cenital solar.

$$R(0^+) / R(0^-) = 0.544$$

(Austin, 1980; Kirk, 1994; Kutser et al, 2006)

3.- PROPIEDADES ÓPTICAS DEL AGUA

- Bentónica y Fondo → Medidas Auxiliares

$$R(0^-, H) = R_{\infty}^- + (R_b - R_{\infty}^-) \cdot \exp[-(k_d + \kappa_u)Z]$$

(Austin, 2004)

MACROALGAS Y
VEGETACIÓN
BENTONICA

Proyecto SARGAL Muestreo en Ría de Vigo 2008

4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



GloboLakes

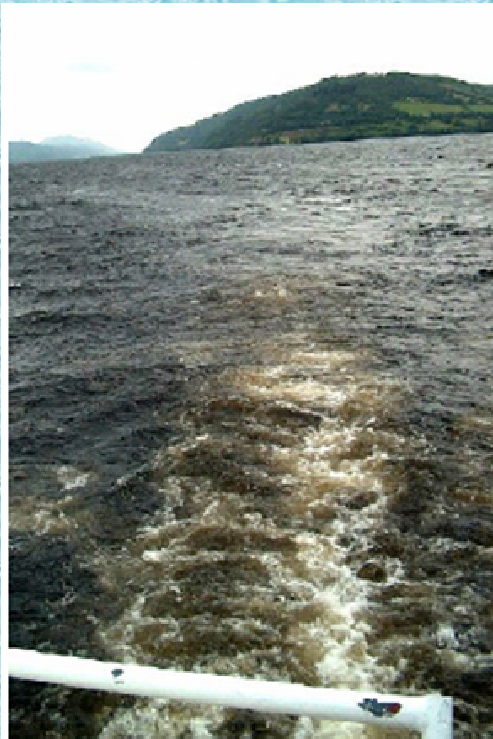
Global Observatory of Lake Responses to Environmental Change

Workshop 10th to 12th December 2012

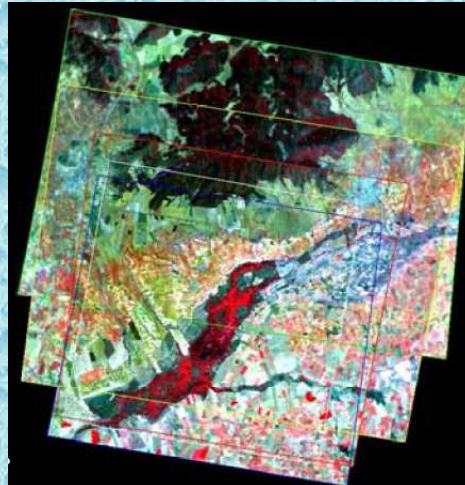


Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

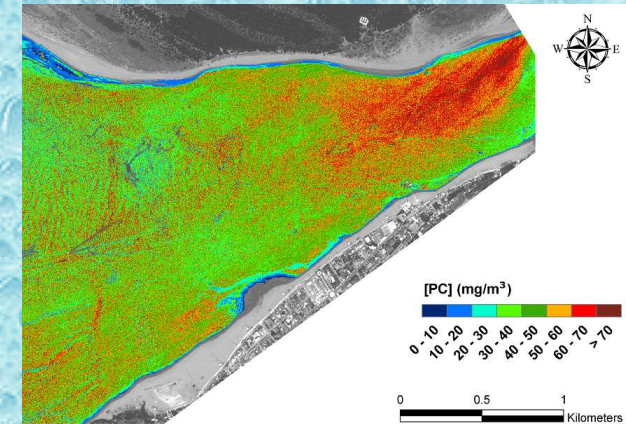
**Lakes
Lagoons
Ponds**



Wetlands



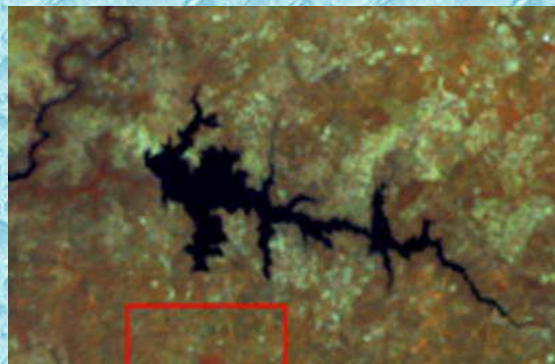
Rivers



Coastal Areas



Reservoirs

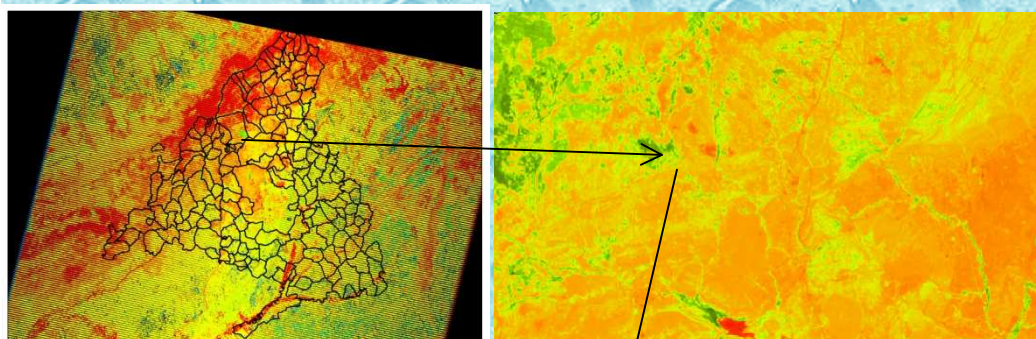


4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS

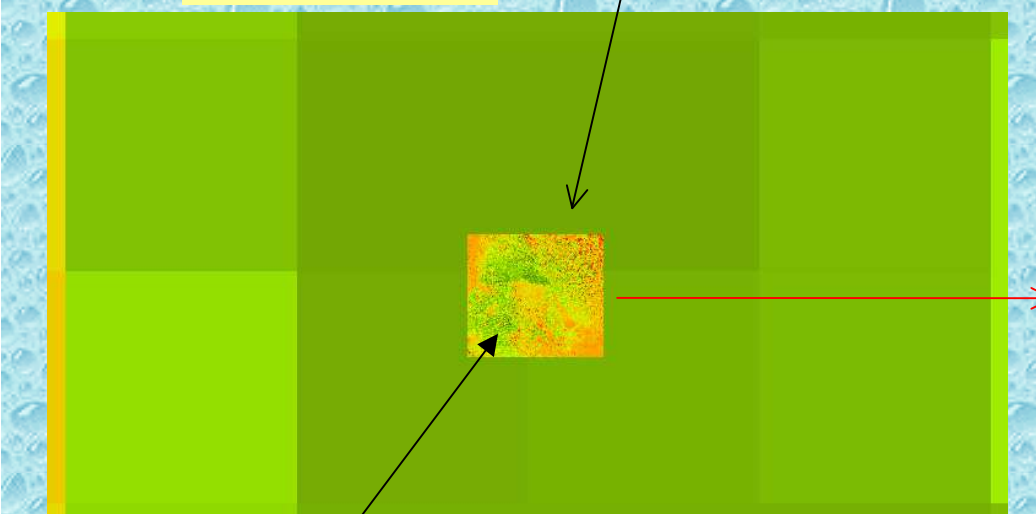


Benthic Cyanobacteria Thematic Mapper
using Unmanned Aerial Vehicle (UAV)

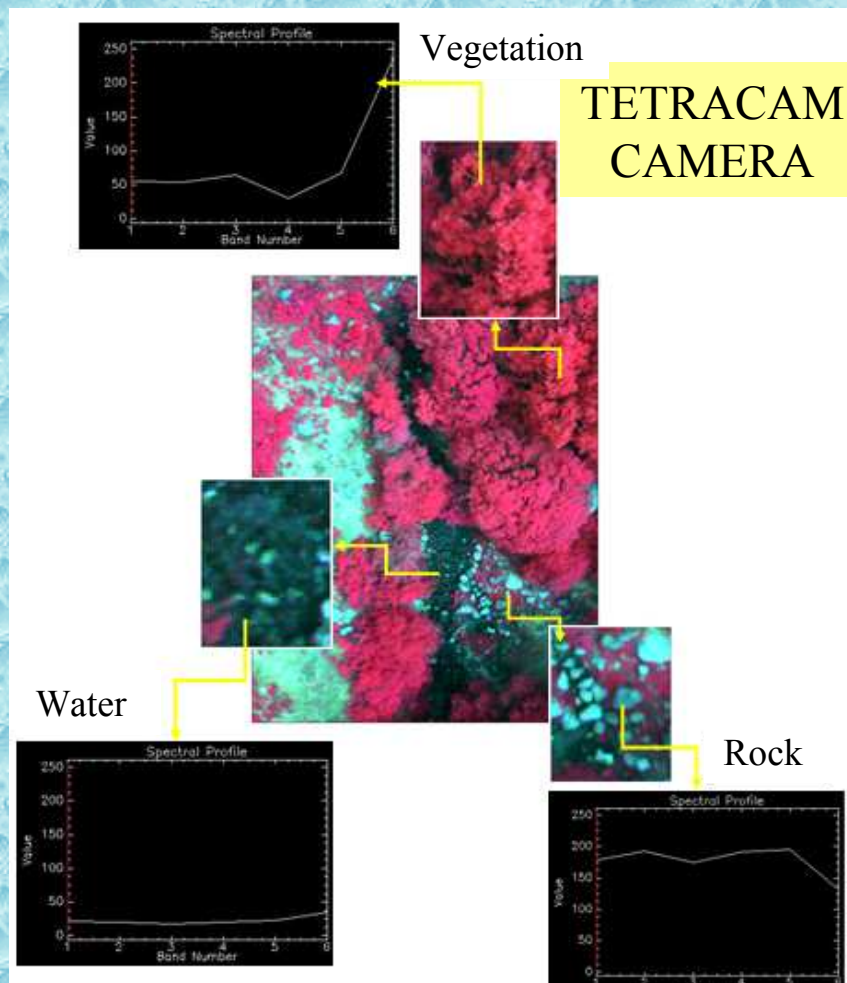
Paper on Draft



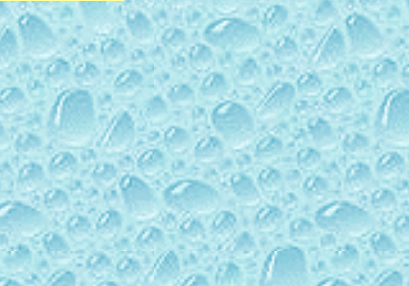
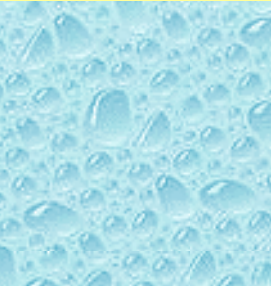
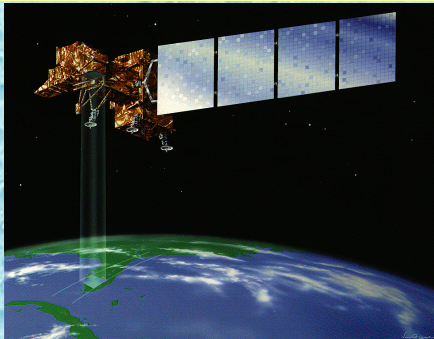
NDVI (LANDSAT 30 m)



NDVI (UAV 3 cm)



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



MINISTERIO DE DEFENSA INTA MINISTERIO DE FOMENTO MINISTERIO DE MEDIO AMBIENTE

CEDEX

Puestos de operación

A control room with people working at computers.

4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



GloboLakes

Global Observatory of Lake Responses to Environmental Change

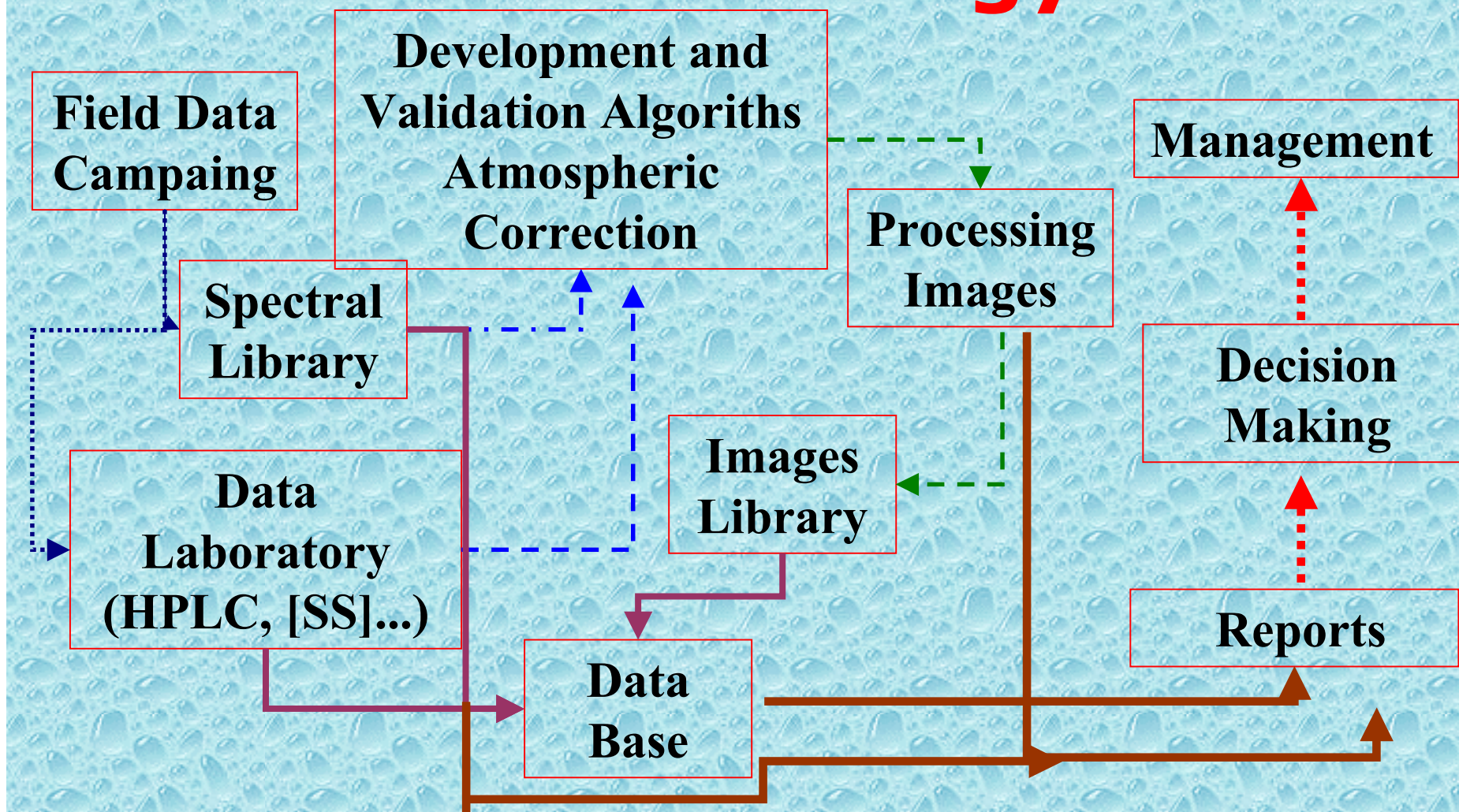
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NATURAL
ENVIRONMENT
RESEARCH COUNCIL

Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

Metodology



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS

¿Objetivo? → Planificación

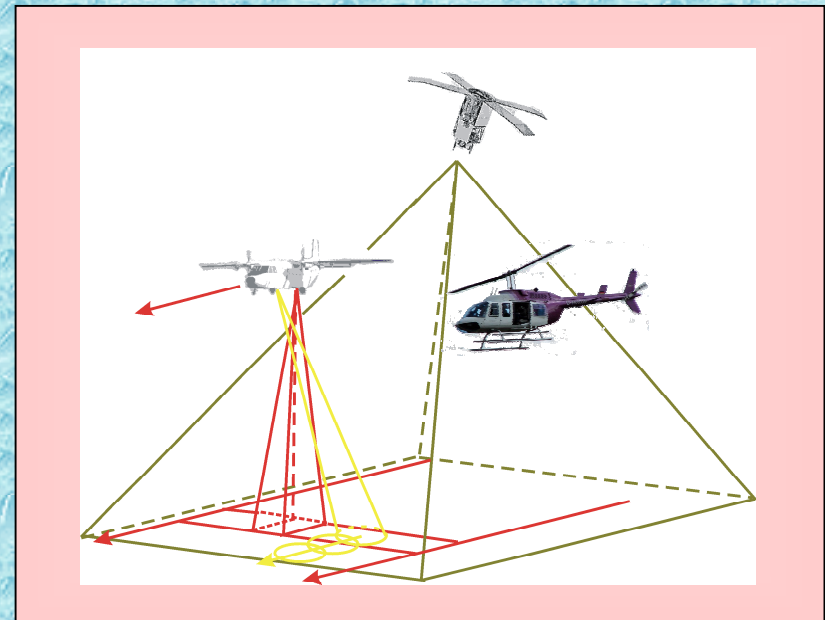
- Corrección Atmosférica → ¿Sensor y Plataforma?

- Validación de Corrección Atmosférica → ¿Sensor y Plataforma?

- Cartografía Temática

- Bentónica y Fondo → Medidas Auxiliares

- Calidad de Agua → Medidas Auxiliares



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

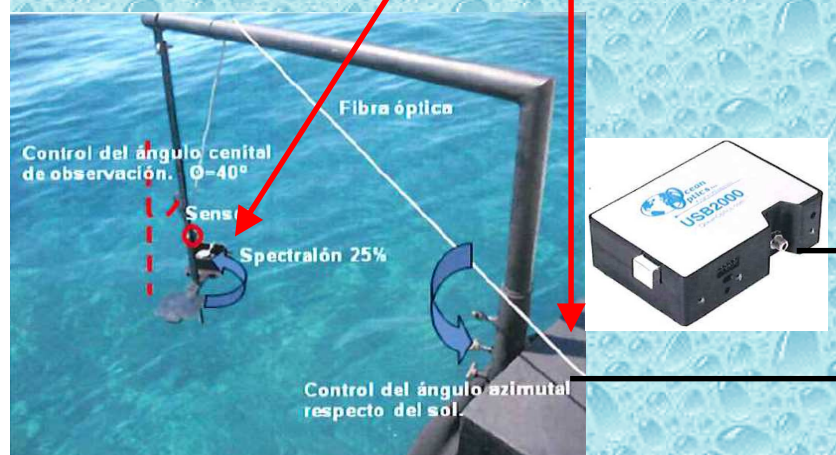
Field Data Campaign: Spectral Library Reflectance

Protocolos NASA (Fargion & Muller 2000)

<http://hercules.cedex.es/Ecosistemas/TeleCongresos/2wCHPa04.pdf>



CEH-CEDEX
Instruments



Environment Water Andalusian
Agency (AMAYA) Instruments

http://www.aet.org.es/revistas/revista36/Numero36_07.pdf

4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

Field Data Campaign: Spectral Library. K_d , K_u



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

Field Data Campaign: Data Laboratory (HPLC, [SS]...)



<http://hercules.cedex.es/Ecosistemas/Laboratorios.htm>

4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



GloboLakes

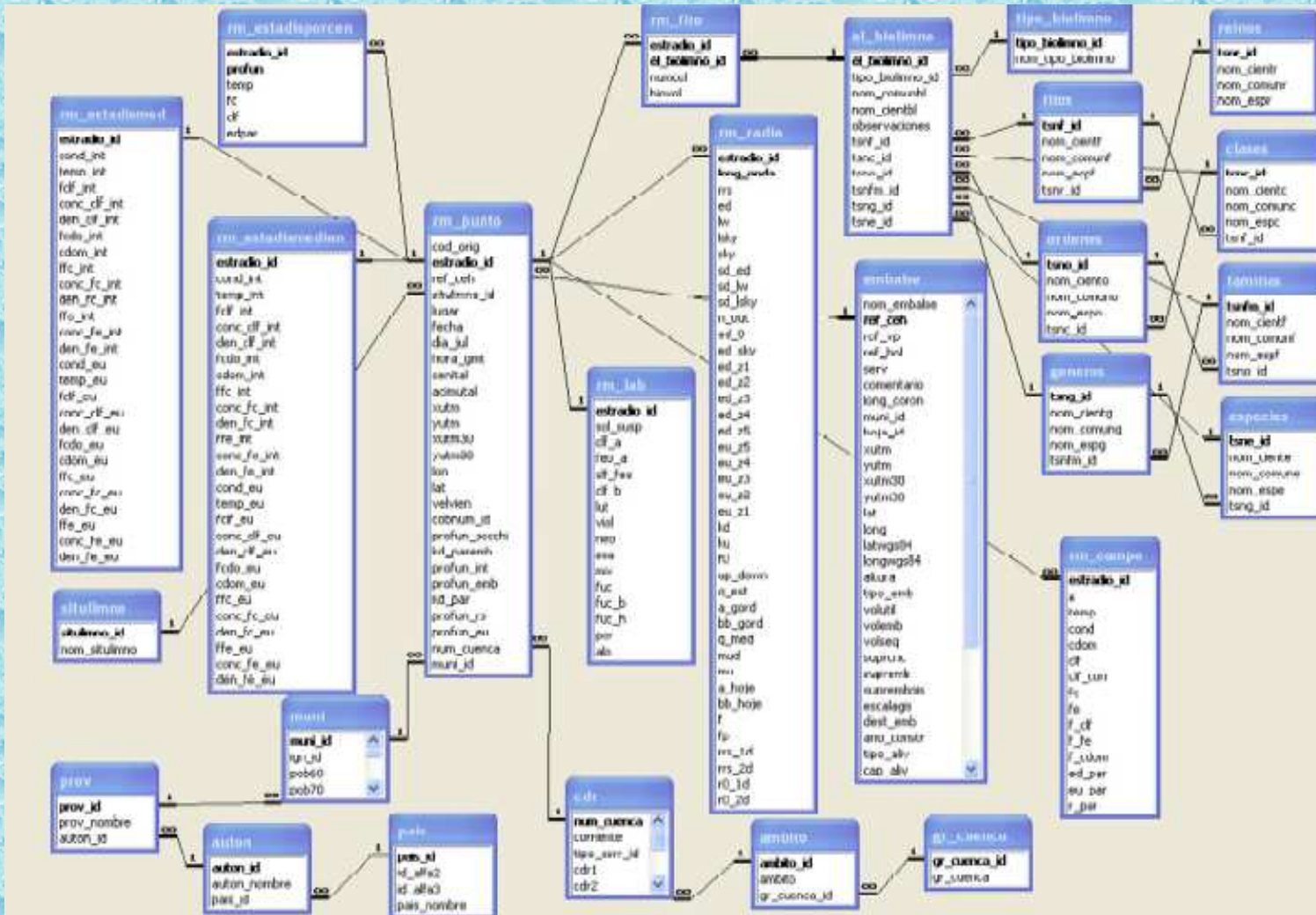
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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

DATA BASE



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



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Global Observatory of Lake Responses to Environmental Change

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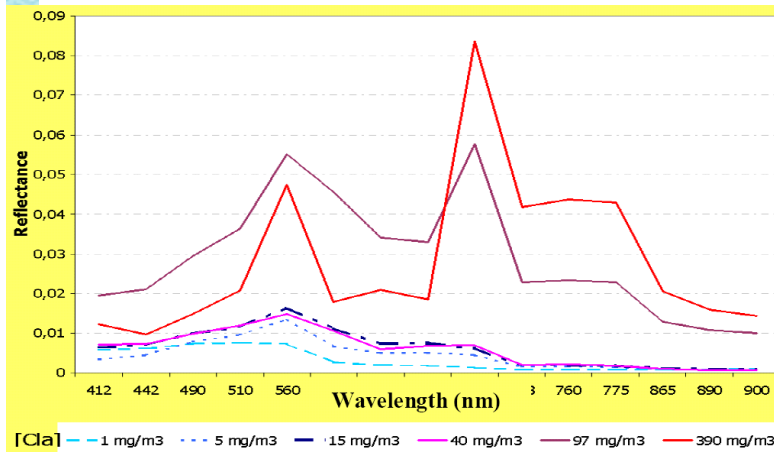


Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

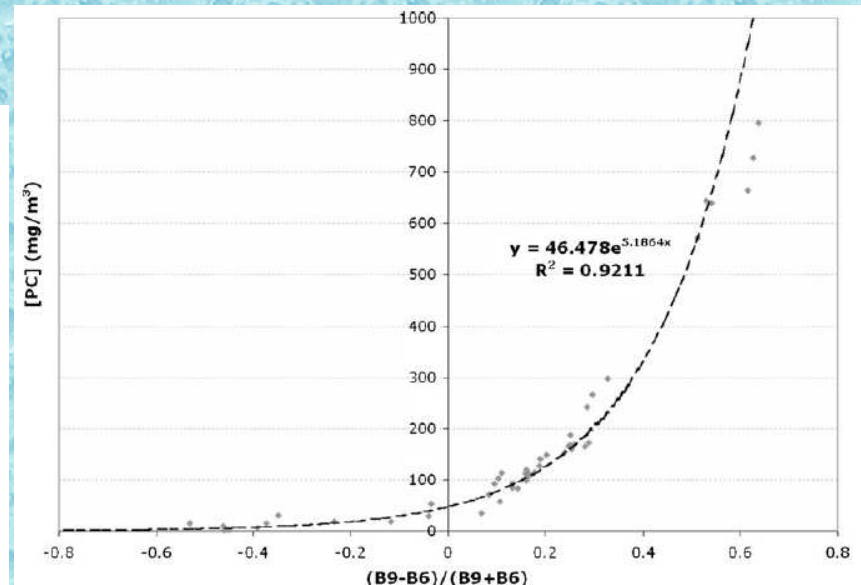
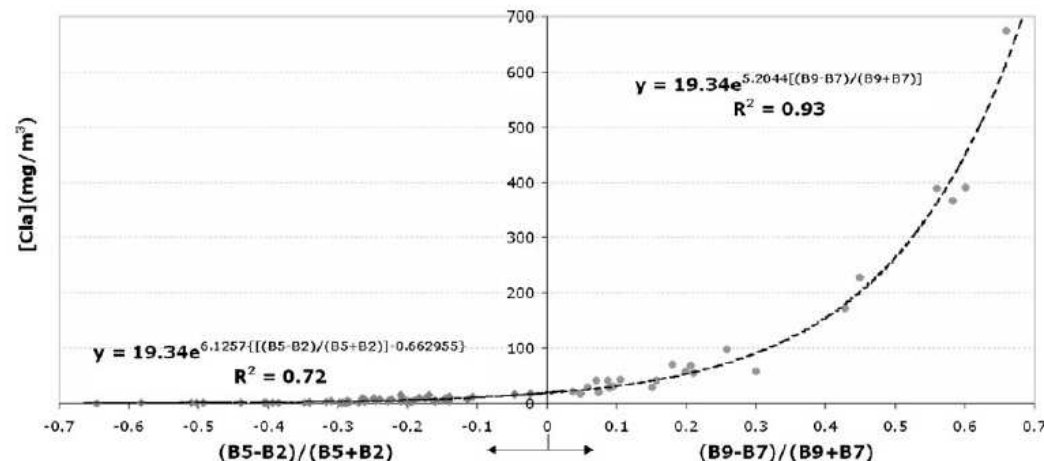
DEVELOPMENT AND VALIDATION ALGORITHMS

MERIS Reflectance bands

Environ Monit Assess
DOI 10.1007/s10661-010-1831-7



Remote sensing as a tool for monitoring water quality parameters for Mediterranean Lakes of European Union water framework directive (WFD) and as a system of surveillance of cyanobacterial harmful algae blooms (SCyanoHABs)



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



GloboLakes

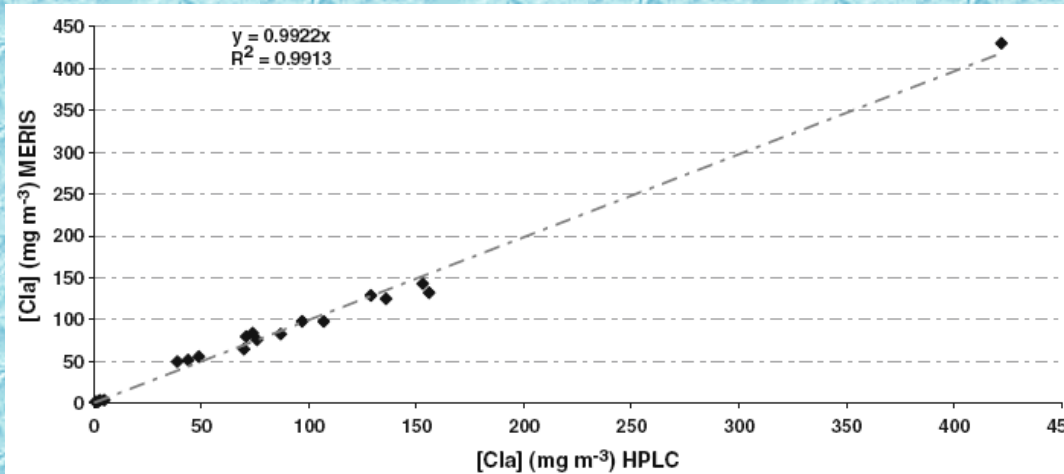
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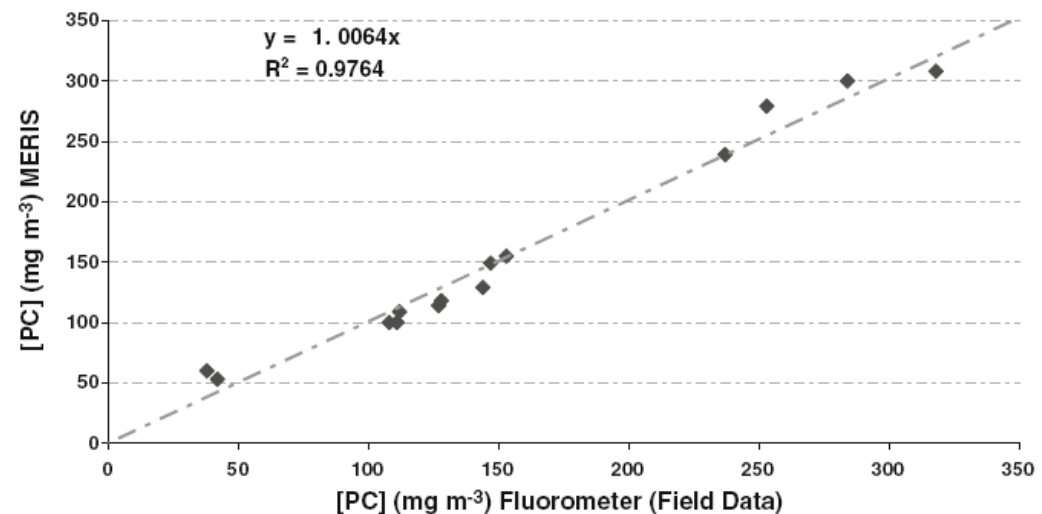
Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

DEVELOPMENT AND VALIDATION ALGORITHMS



Comparison of chlorophyll-a HPLC (Field Data) and chlorophyll-a MERIS imagery ($n = 19$, $p < 0.001$)

Comparison of [PC] fluorometer measurements (Field Data) and [PC] MERIS imagery ($n = 14$, $p < 0.001$)



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

PROCESSING IMAGES

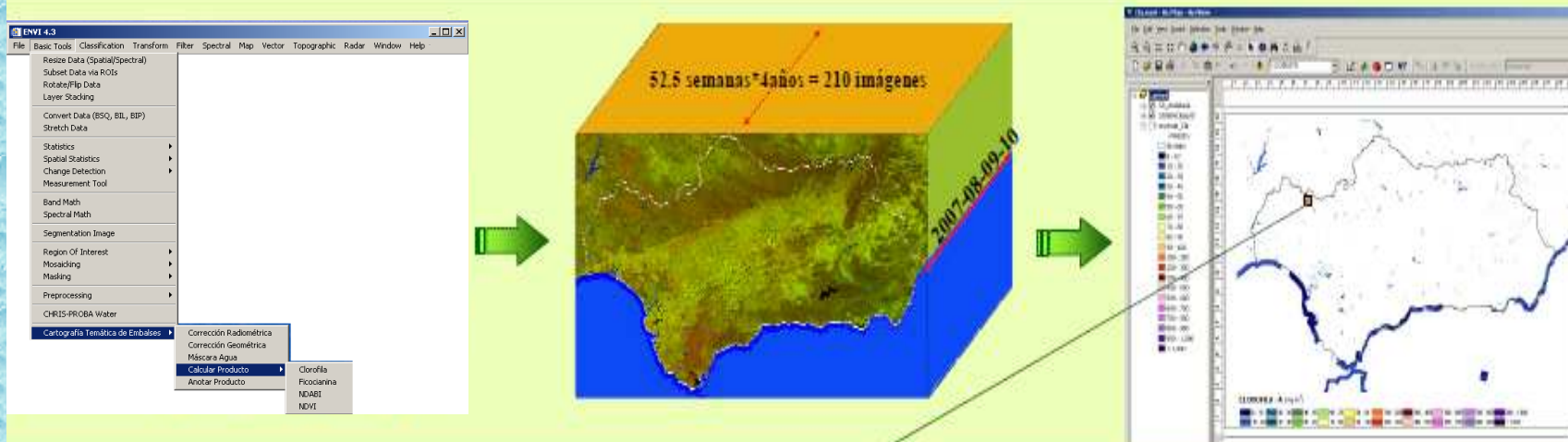
2º Congreso Ibérico de Cianotoxinas

Sevilla 7 y 8 de Julio de 2011

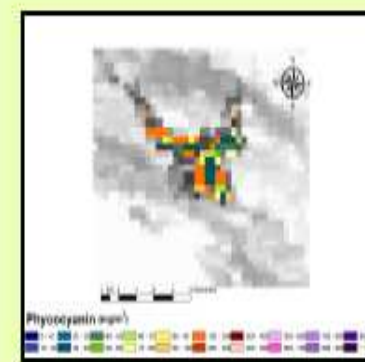
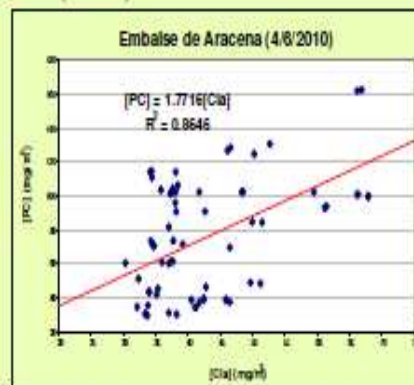
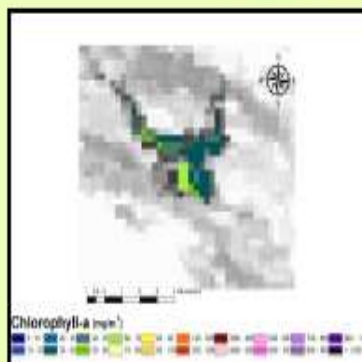
IV Reunión de la Red de Estudios en Cianotoxinas



PROCESAMIENTO DE IMÁGENES MERIS: 2007 - 2010



EMBALSE DE ARACENA (4/6/2010)



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



GloboLakes

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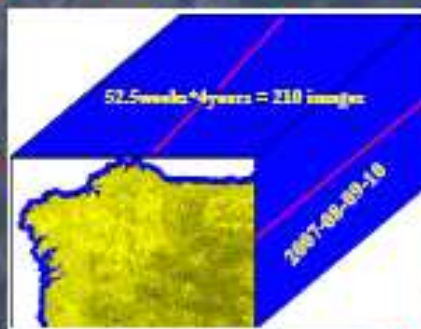
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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

PROCESSING IMAGES

PROCESSING OF MERIS IMAGES: 2007 - 2010



Dpto. Química Analítica y Alimentaria
Universidad de Vigo

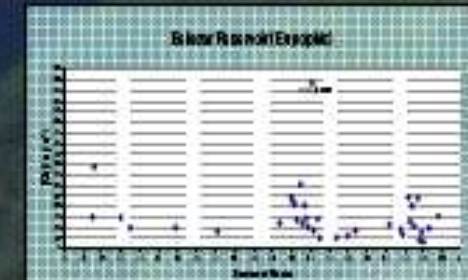
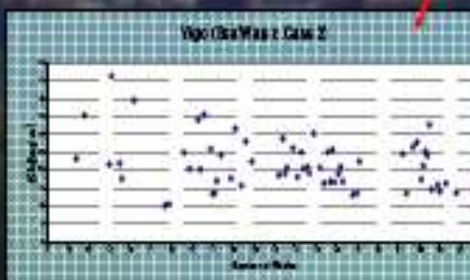
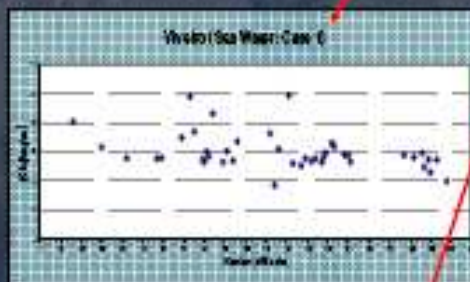
AOAC INTERNATIONAL

Marine and Freshwater Toxins Analysis

Second Joint Symposium and AOAC Task Force Meeting

BOOK OF ABSTRACTS

May 1-5, 2011
Baiona-Pontevedra, Spain



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



GloboLakes

Global Observatory of Lake Responses to Environmental Change

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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RESERVOIRS



MINISTERIO
DE FOMENTO

MINISTERIO
DE MEDIO AMBIENTE
Y MEDIO RURAL Y MARINO



“Monitoring by remote sensing the ecological state of different Spanish inland water bodies through the mapping of photosynthetic pigments characteristics of cyanobacteria”



European Master of Inland Water Quality Assessment
Master Thesis 2008/2009
CLARA ARANCÓN ALONSO

Professional tutor: Jose Antonio Domínguez Gómez
Academic tutor: Antonio Quesada de Corral

<http://hercules.cedex.es/Ecosistemas/09Dic.pdf>

4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



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Workshop 10th to 12th December 2012



NATURAL
ENVIRONMENT
RESEARCH COUNCIL

Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RESERVOIRS

OECD trophic classification and “Expanded OECD trophic classification”

TROPIC STATE (OCDE CLASSIFICATION)	
	Chl-a (mg/m ³)
Ultraoligotrophic	< 1
Oligotrophic	1-2,5
Mesotrophic	2,5-7,9
Eutrophic	8-25
Hypereutrophic	> 25

EXPANDED OECD TROPIC CLASSIFICATION	
	Suggested boundaries Chl-a (mg/m ³)
Ultraoligotrophic	< 1
Oligotrophic	1-2,5
Mesotrophic	2,5-7,9
Eutrophic	8-25
Hypereutrophic-1	25,1-50
Hypereutrophic-2	50-100
Hypereutrophic-3	100,1-200
Hypereutrophic-4	> 200

4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



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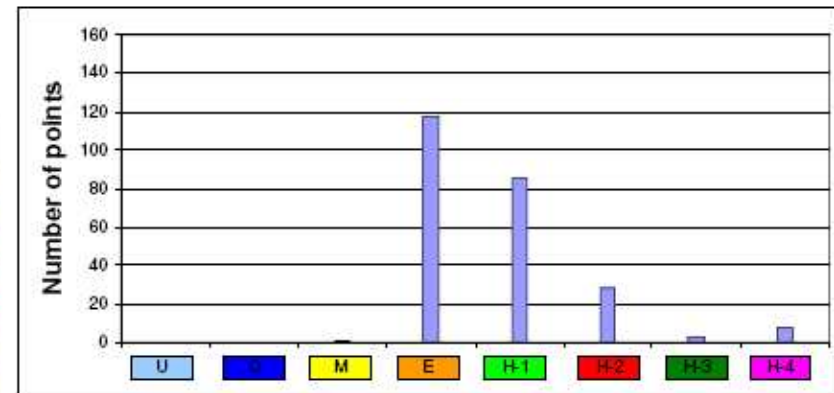
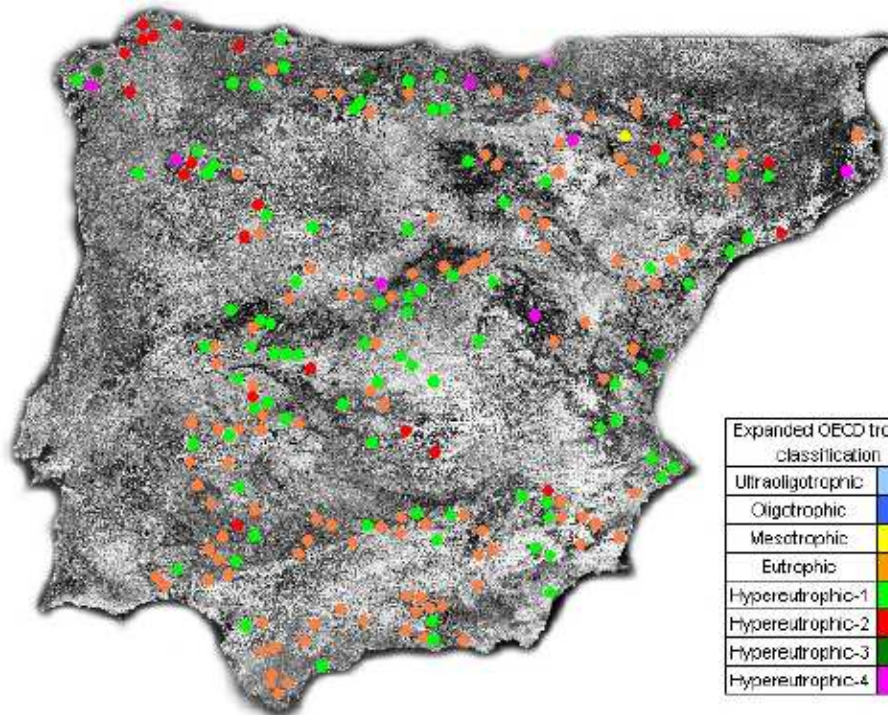


Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RESERVOIRS

Distribution map of the **Trophic state** found at each water body

<http://hercules.cedex.es/Ecosistemas/09Dic.pdf>



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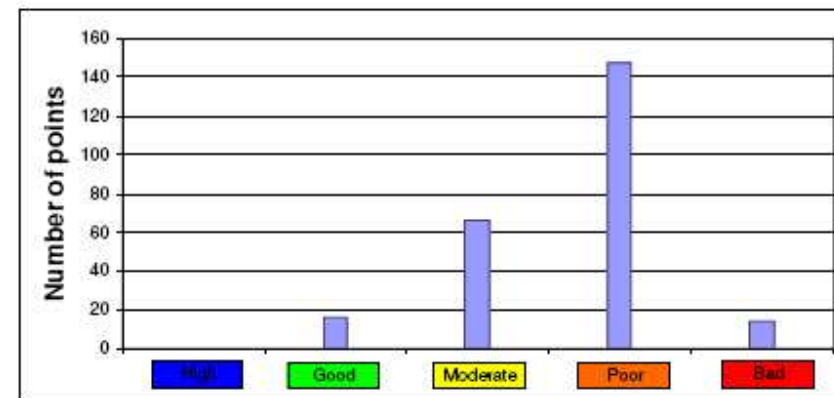
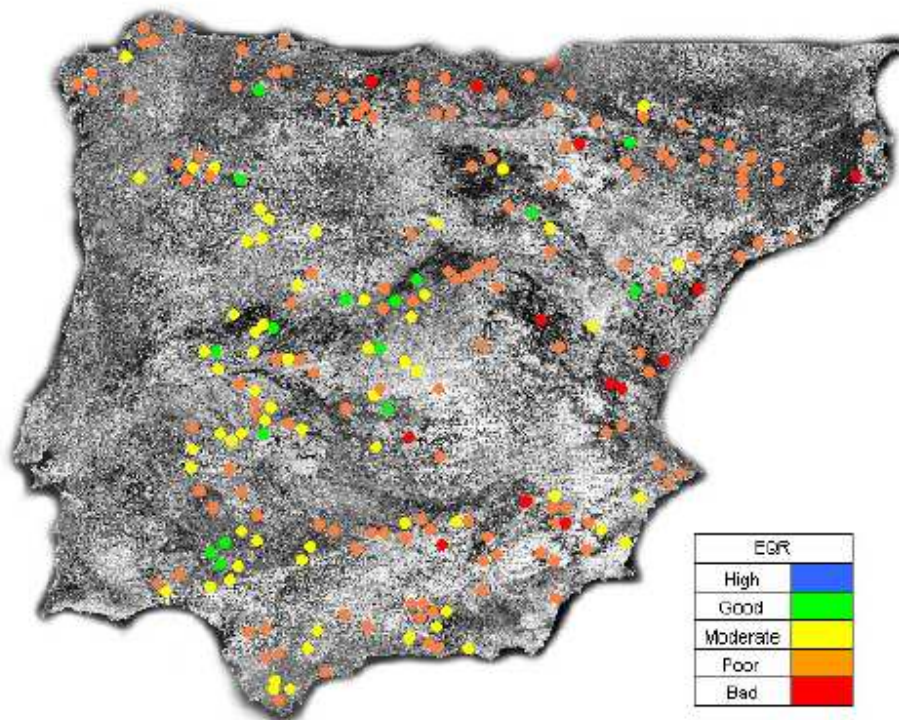


Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RESERVOIRS

Distribution map of the **EQR** found at each water body

<http://hercules.cedex.es/Ecosistemas/09Dic.pdf>



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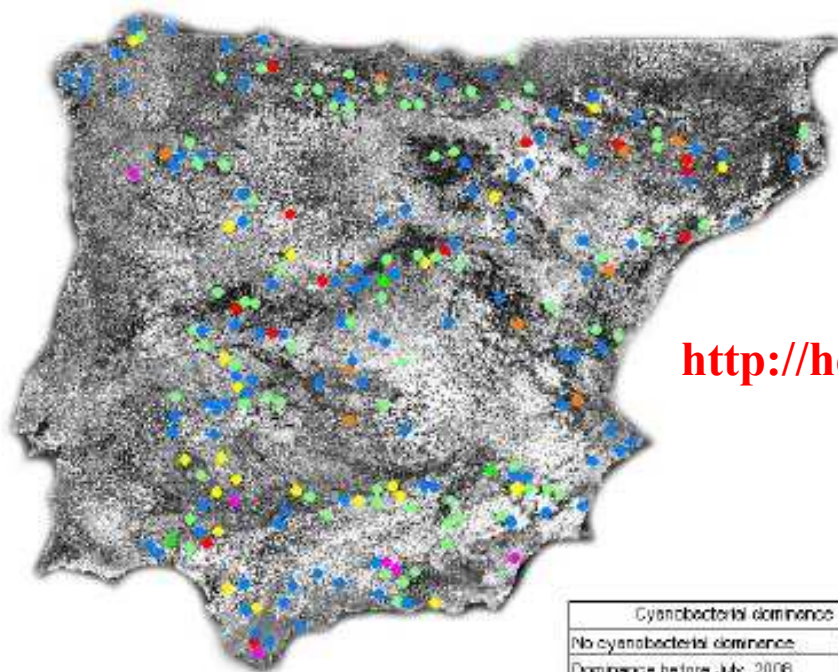
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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

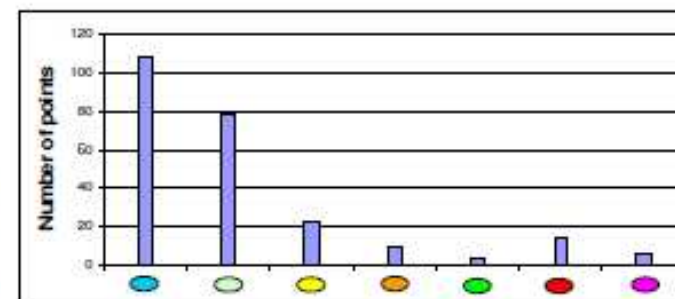
RESULTS: RESERVOIRS

Distribution map of the **Cyanobacterial dominance** found at each water body



<http://hercules.cedex.es/Ecosistemas/09Dic.pdf>

Cyanobacterial dominance	
No cyanobacterial dominance	Blue
Dominance before July, 2008	Light Green
Dominance during July, 2008	Yellow
Dominance during August, 2008	Orange
Dominance during September, 2008	Green
Dominance during October, 2008	Red
Dominance after October, 2008	Magenta



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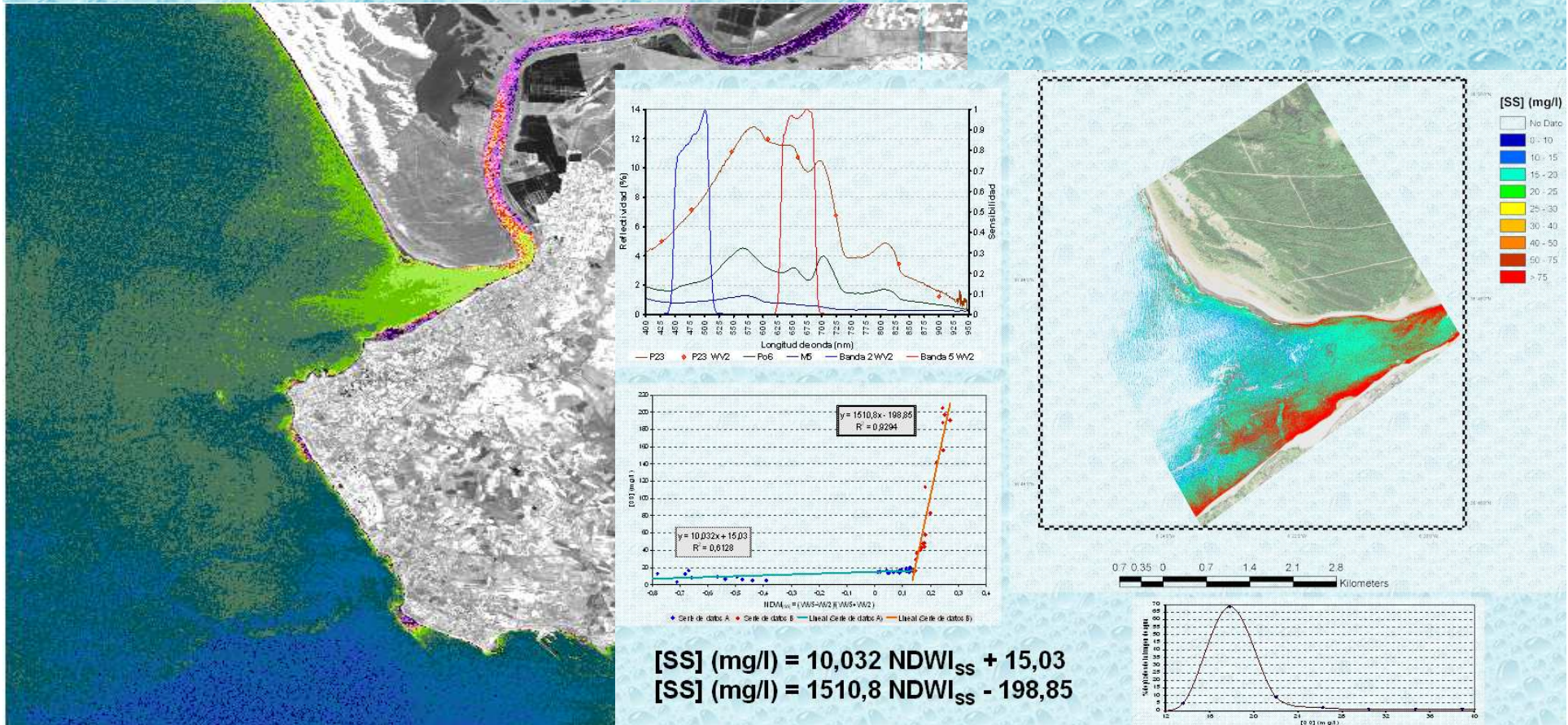
Global Observatory of Lake Responses to Environmental Change

Workshop 10th to 12th December 2012



Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: RIVERS MONITORING GUADALQUIVIR RIVER: LANDSAT and WORD VIEW 2



$$[SS] \text{ (mg/l)} = 10,032 \text{ NDWI}_{SS} + 15,03$$

$$[SS] \text{ (mg/l)} = 1510,8 \text{ NDWI}_{SS} - 198,85$$

4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



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RESULTS: WETLANDS



2008 IEEE International Geoscience & Remote Sensing Symposium
July 6-11, 2008 | Boston, Massachusetts, U.S.A.

<http://hercules.cedex.es/Ecosistemas/IGARSS2008.pdf>

APPLYING MULTI-ANGLE HYPERSPECTRAL DATA TO DETECT HUMAN-INDUCED CHANGES CAUSING WETLAND DEGRADATION IN SEMI-ARID AREAS (NATIONAL PARK LAS TABLAS DE DAIMIEL, SPAIN)

**Thomas Schmid¹, José Antonio Domínguez², Jesús Solana³,
José Gumuzzio³ and Magaly Koch⁴**

¹CIEMAT, Av. Complutense 22, 28040, Madrid, Spain.

²Center for Hydrographic Studies CEDEX, Paseo Bajo de la Virgen del Puerto, 3, 28005 Madrid, Spain.

³Autonomous University of Madrid, Science Faculty, Madrid, Spain.

⁴Centre for Remote Sensing, Boston University, Boston, MA, USA.

thomas.schmid@ciemat.es

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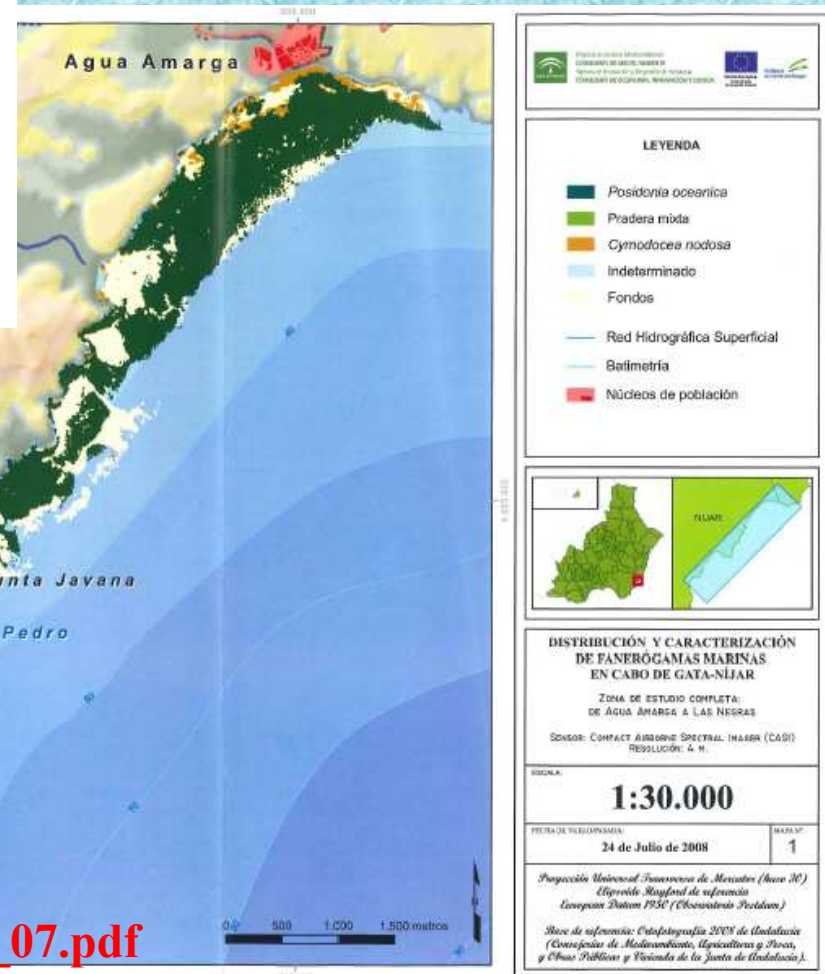
RESULTS: COASTAL AREAS

Development of a methodology for the characterization of seagrass on the andalusian coast using remote sensing techniques with hyperspectral sensors

Remote sensing is considered a non-invasive technique to identify and characterize seagrass. The evaluation of the use of images and their analysis is the beginning of a new line of research to know the best way for mapping the ma-rine ecosystem of the Mediterranean coast of Andalusia.

The biophysical and environmental characterization of the studied area, the Maritime Terrestrial Natural Park of Cabo de Gata-Níjar was conducted during different field campaigns between 2007 and 2009, with the objective of measuring the apparent water properties (reflection and diffuse attenuation), the spectral response of the different types of seagrass (*Posidonia oceanica* and *Cymodocea nodosa*) and bottom substrate types. From these data, we selected the most appropriate airborne and spaceborne sensors for the study and its spectral and spatial resolution (CASI and CHRIS-Proba sensors).

As a result of this research, maps of the seabed were obtained in the study area as well as a detailed methodology for the characterization of seagrass, extendable to the Mediterranean coast.



http://www.aet.org.es/revistas/revista36/Numero36_07.pdf

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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

RESULTS: COASTAL AREAS

Mar Biol
DOI 10.1007/s00227-012-1987-5

ORIGINAL PAPER

Assessment of AHS (Airborne Hyperspectral Scanner) sensor to map macroalgal communities on the Ría de vigo and Ría de Aldán coast (NW Spain)

G. Casal · N. Sánchez-Carnero ·
J. A. Domínguez-Gómez · T. Kutser ·
J. Freire

Received: 30 August 2011 / Accepted: 19 June 2012
© Springer-Verlag 2012

Abstract Ría de Vigo and Ría de Aldán have high biological richness that is reflected in the number of environmental protection areas like the Atlantic Islands National Park and five places of community interest. Benthic algal communities play an important role in these ecosystems due to their ecological functions and support a great part of this biological richness. We tested by means of bio-optical modelling and Airborne Hyperspectral Scanner (AHS) images to what extent remote sensing could be used to map these communities in Ría de Vigo and Ría de Aldán (NW Spain). Reflectance spectra of dominating macroalgae groups were modelled for different water depths in order to estimate the separability of different bottom types based on their spectral signatures and the spectral characteristics of the AHS. Our results indicate that separation between three macroalgae groups (green, brown and red) as well as sand is possible when the bottoms are emerged during low tide. The spectra differences decrease rapidly with increasing water depth. Two types of classifications were carried out with the three AHS images: maximum likelihood and spectral angle mapper (SAM).

Maximum likelihood showed positive results reaching overall accuracy percentages higher than 95 % and kappa coefficients higher than 0.90 for the bottom classes: *shallow sand*, *deep sand*, *emerged rock*, *emerged macroalgae* and *submerged macroalgae*. Sand and algae substrates were then separately analysed with SAM. These classifications showed positive results for differentiation between green and brown macroalgae until 5 m depth and high differences between all macroalgae and sandy substrate. However, differences between red and brown macroalgae are only detectable when the algae are emerged.

Introduction

Benthic algal communities play an important role in coastal ecosystems due to their ecological functions. These communities are essential for many organisms as habitat (e.g. Cacabelos et al. 2010), mating and nursery grounds (e.g. Shaffer 2003), feeding areas (e.g. Lorentsen et al. 2004) and refuge (e.g. Gotceitas et al. 1997). Another relevant aspect is their important contribution to primary production

Estuarine, Coastal and Shelf Science 94 (2011) 281–290



Contents lists available at ScienceDirect

Estuarine, Coastal and Shelf Science

journal homepage: www.elsevier.com/locate/ecss



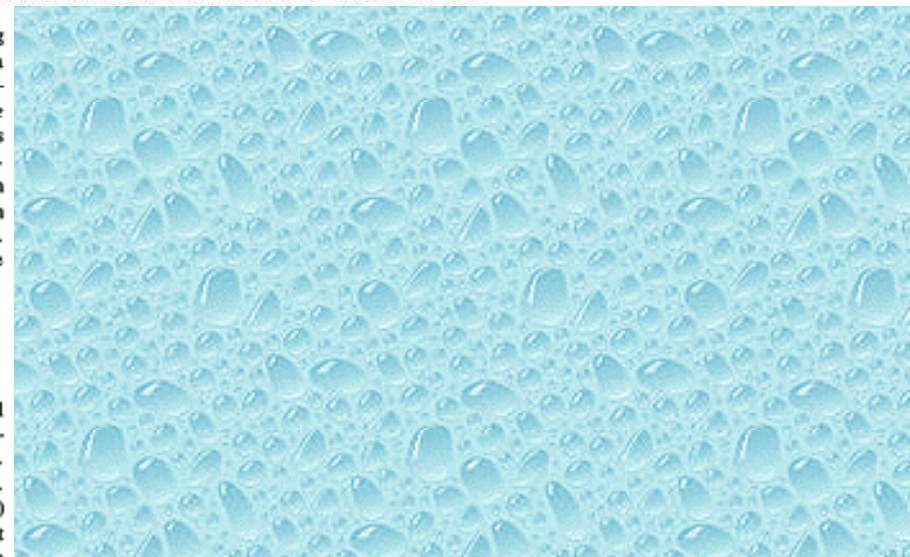
Mapping benthic macroalgal communities in the coastal zone using CHRIS-PROBA mode 2 images

G. Casal ^{a,*}, T. Kutser ^b, J.A. Domínguez-Gómez ^c, N. Sánchez-Carnero ^a, J. Freire ^a

^a Grupo de Recursos Marinos y Pesquerías, Facultad de Ciencias, Universidad de A Coruña, Rúa de Fraga 10, 15008 A Coruña, Spain

^b Estonian Marine Institute, University of Tartu, Mäealuse 14, Tallinn 12618, Estonia

^c Centro de Estudios Hidrográficos (CEDEX), Paseo Bajo de la Virgen del Puerto 3, 28005 Madrid, Spain



4.- TELEDETECCIÓN EN ECOSISTEMAS ACUÁTICOS



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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

REPORTS & PAPERS

ESTUDIO DE LA CALIDAD DEL AGUA DE LAS LAGUNAS DE GRAVERA MEDIANTE TELEDETECCIÓN

Presentación 14/03/2003

Evolución Trófica

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Índice de figuras

Índice de tablas

JOSÉ ANTONIO DOMÍNGUEZ GÓMEZ

Portada Dedicatoria Agradecimientos

Remote sensing as a tool for monitoring water quality parameters for Mediterranean Lakes of European Union water framework directive (WFD) and as a system surveillance of cyanobacterial harmful algal blooms (CyanoHABs)

by Antonio Domínguez Gómez, Carolina Alonso Alonso, and Alonso García

14 August 2008 / Accepted 12 December 2011
Springer Science+Business Media B.V. 2011

Remote sensing has been used from the 60s to study inland water quality. However, it is not until the beginning of the twenty-first century that remote sensing is used to monitor the water quality of aquatic ecosystems. This paper presents a remote sensing approach to monitor the water quality of Mediterranean lakes. The paper presents the methodology used, from the field data acquisition with which to use a reference aquatic library and the study of different atmospheric correction systems for the MERIS and SeaWiFS images to the development of algorithms to determine chlorophyll a and phycocyanin concentrations and biomass. The three algorithms allow determining water quality and ecological status, apart from generating a surveillance map of these cyanobacteria with a main objective of Assessment of the Water and Ecological Status (AWES) and Ecological Quality (EQS) of the lakes. An international agreement between the Centre of Hydrographic Studies (CHS) and the US Bureau of Reclamation (Damon, CO) was signed for the development of methodology for the application of satellite images to the water quality of Spanish reservoirs through the Remote Mapping system of the Satellite of Color and Polar (SPOL) and Landsat 5 (DMSP and NOAA) and Landsat 7 (SPOL and NOAA) and Landsat 5 (SPOL and NOAA) and Landsat 7 (SPOL and NOAA).

Marine and Freshwater Toxins Analysis
Second Joint Symposium and AOAC Task Force Meeting

BOOK OF ABSTRACTS

May 1-5, 2011
Baiona-Pontevedra, Spain

AOAC INTERNATIONAL

IMPLEMENTACIÓN DE NUEVAS TECNOLOGÍAS MEDIANTE LA APLICACIÓN AL SECTOR MEDIOAMBIENTAL DE METODOLOGÍAS AVANZADAS CON SENSORES HIPERESPECTRALES

CARACTERIZACIÓN DE PRADERAS DE FANEROGAMAS MARINAS

Author's personal copy

Assessment of AHS (Airborne Hyperspectral Scanner) sensor to map macroalgal communities on the Ria de Vigo and Ria de Arousa coast (NW Spain)

G. Casal, J. K. Muñoz-Carmona, J. A. Domínguez Gómez, T. Kuter, J. Pérez

Abstract: The Ria de Vigo and Ria de Arousa have high biological richness due to different in the number of macroalgal species. The aim of this work is to assess the use of AHS (Airborne Hyperspectral Scanner) sensor to map macroalgal communities on the Ria de Vigo and Ria de Arousa coast (NW Spain). The study was carried out in two campaigns: one in the Ria de Vigo and one in the Ria de Arousa. The results show that the AHS sensor is able to detect and map macroalgal communities on the Ria de Vigo and Ria de Arousa coast (NW Spain). The results show that the AHS sensor is able to detect and map macroalgal communities on the Ria de Vigo and Ria de Arousa coast (NW Spain).

Multi-scale strategies for the monitoring of freshwater cyanobacteria: Reducing the sources of uncertainty

Ramsy Agha¹, Samuel Grés¹, Lars Wörmer², José Antonio Domínguez¹, Antonio Quesada^{1*}

¹Departamento de Biología, C. Darwin 2, Universidad Autónoma de Madrid, 28002 Cantanabia, Spain
²United Graduate Center for Global Change, Institute Environmental Science & Data of Gifu University, University of Niigata, 2013 Niigata, Germany
³Centro de Estudios Hidrográficos, CEDEX, C/ Viriato del Puerto 3, 28002 Madrid, Spain

ABSTRACT

Operational monitoring of cyanobacteria in complex freshwater ecosystems has been a challenge for several decades. Monitoring cyanobacteria has been an operational monitoring task for several decades. Monitoring cyanobacteria has been a challenge for several decades. Monitoring cyanobacteria has been a challenge for several decades.

<http://hercules.cedex.es/Ecosistemas/teledeteccion.htm>

MINISTERIO DE FOMENTO

CEDEX CENTRO DE ESTUDIOS Y EXPERIMENTACIÓN DE OBRAS PÚBLICAS

Teledetección

Buscar en el CEH
Mapa del Web
Web master
Etc ...

Principal Ecología de los Ecosistemas Lab. Calidad de las Aguas Teledetección Calidad de los Ecosistemas ISO 9001: 2008

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Directiva Marco del Agua

INTA-ICC-ESA

Universidades

Publicaciones y Congresos

Links

En 1976 la Sección Técnica de Teledetección de Centro de Estudios Hidrográficos inicia sus trabajos utilizando imágenes MSS de los satélites Landsat 1-3. Desde entonces ha desarrollado multitud de trabajos y proyectos de investigación encaminados a que la teledetección sea una herramienta útil en la gestión de los Ecosistemas Acuáticos Continentales ([Actividades.pdf](#))

5.-CONTAMINACIÓN DE AGUAS MEDIANTE TELEDETECCIÓN

22.12.2000

ES

Diario Oficial de las Comunidades Europeas

L 327/1

I

(Actos cuya publicación es una condición para su aplicabilidad)

DIRECTIVA 2000/60/CE DEL PARLAMENTO EUROPEO Y DEL CONSEJO

de 23 de octubre de 2000

por la que se establece un marco comunitario de actuación en el ámbito de la política de aguas

<https://www.boe.es/doue/2000/327/L00001-00073.pdf>

5.-CONTAMINACIÓN DE AGUAS MEDIANTE TELEDETECCIÓN



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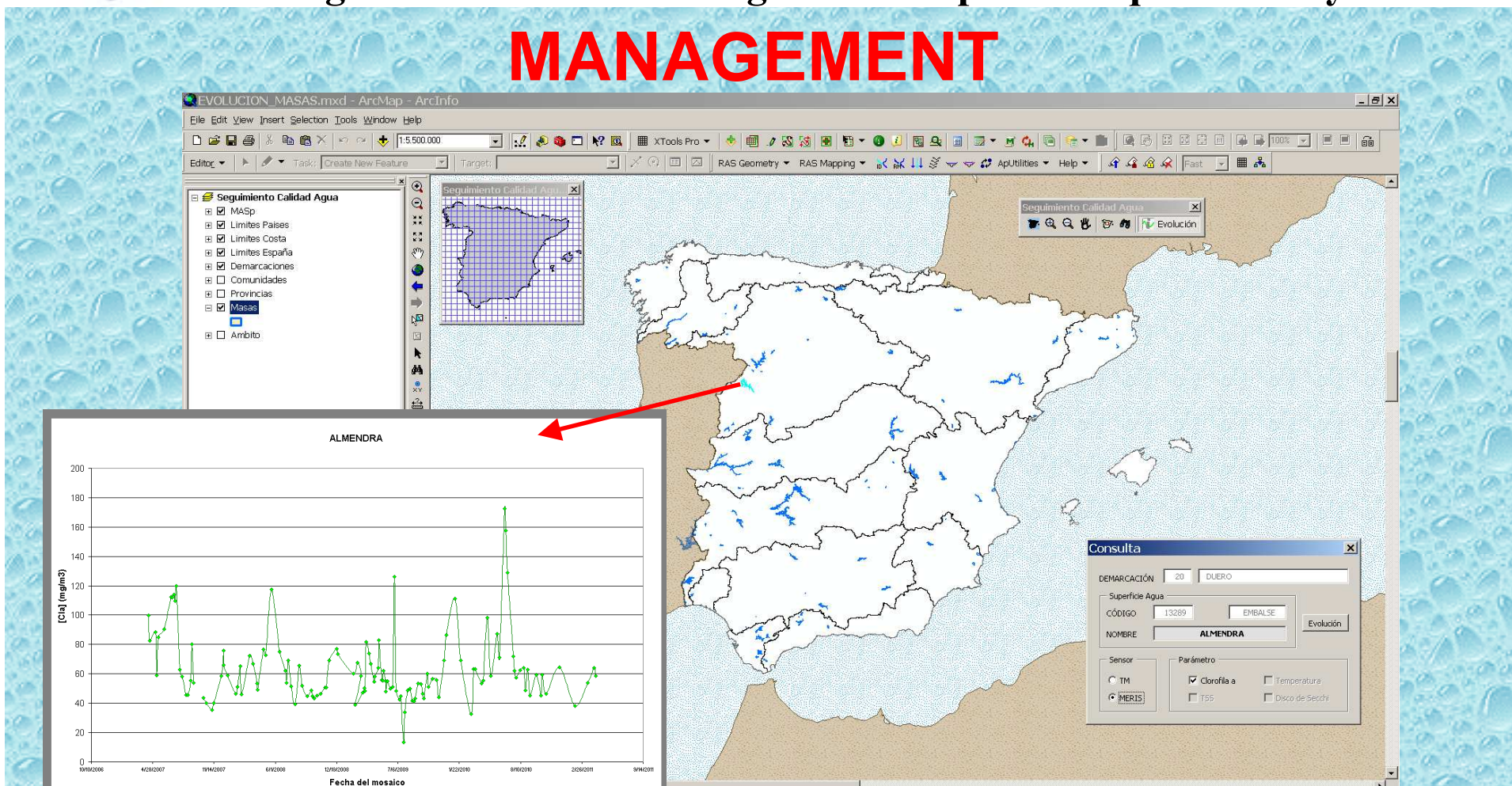
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MANAGEMENT



MINISTERIO DE AGRICULTURA, ALIMENTACIÓN Y MEDIO AMBIENTE

SECRETARÍA DE ESTADO DE MEDIO AMBIENTE

DIRECCIÓN GENERAL DEL AGUA

ESTUDIO DE UTILIZACIÓN DE LA TELEDETECCIÓN COMO HERRAMIENTA DE IDENTIFICACIÓN, SEGUIMIENTO Y CONTROL DEL MEDIO HÍDRICO Y PROPUESTA DE NUEVAS APLICACIONES EN LA PLANIFICACIÓN HIDROLÓGICA.

DIRECCIÓN

SUBDIRECCIÓN GENERAL DE PLANIFICACIÓN Y USO SOSTENIBLE DEL AGUA

CONSULTOR:



5.-CONTAMINACIÓN DE AGUAS MEDIANTE TELEDETECCIÓN



Proyecto AG_UAS

LIFE09 ENV / ES/ 0456

Gestión sostenible del agua a nivel regional
mediante Teledetección Aérea basada en
Sistemas Aéreos no Tripulados (UAS)

http://www.lifeaguas.es/theme/lifeaguas/files/pdfs/Layman_LIFE_AG_UAS_es.pdf

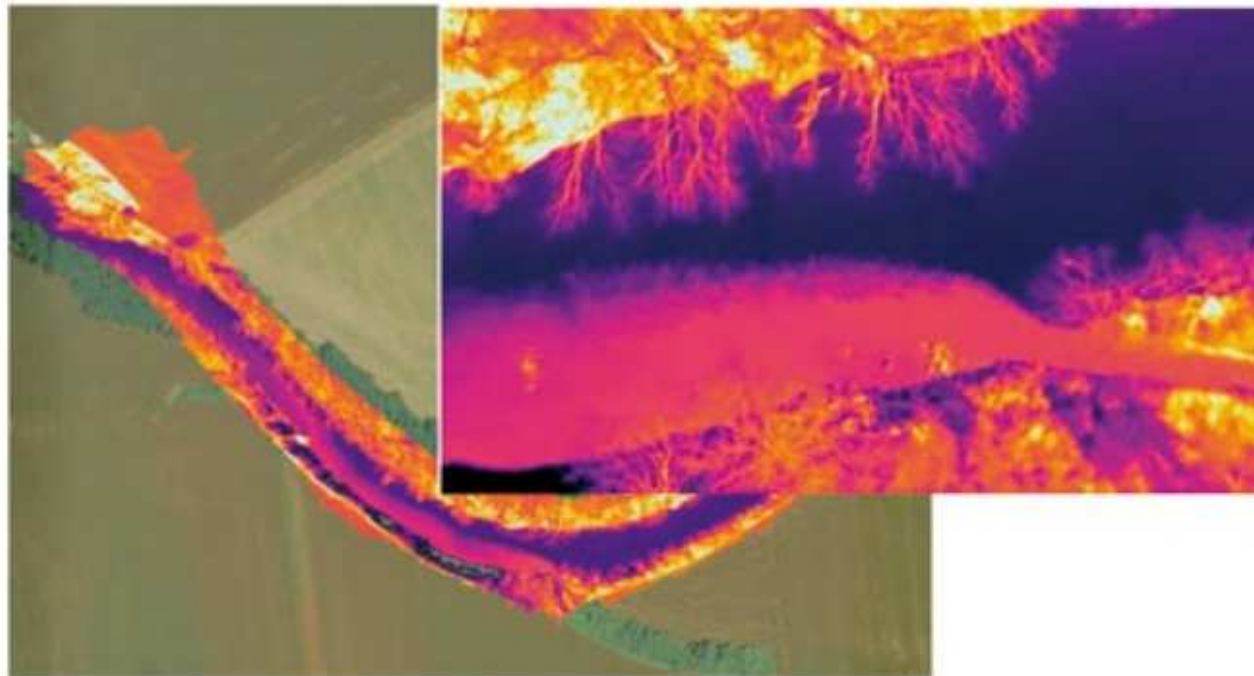
5.-CONTAMINACIÓN DE AGUAS MEDIANTE TELEDETECCIÓN

4. Detección de vertidos y emisiones en aguas superficiales

La finalidad de esta aplicación es demostrar la capacidad de la metodología para la identificación y control de emisiones en aguas superficiales, facilitando el cumplimiento de lo establecido en la Directiva Marco del Agua.

Mediante el sensor remoto (IR-8-12 μ) se pueden detectar fácilmente este tipo de vertidos, debido a la diferencia de temperatura entre el vertido y las aguas superficiales receptoras.

El resultado es una imagen que suministra información espacial del vertido.



Detección de vertidos en el río Arga

5.-CONTAMINACIÓN DE AGUAS MEDIANTE TELEDETECCIÓN



FACULTAD DE BIOLOGÍA, CIENCIAS AMBIENTALES Y QUÍMICA

GRADO EN CIENCIAS AMBIENTALES

TRABAJO DE FIN DE GRADO

El humedal de las Lagunas de Puebla de Beleña:

Seguimiento de su comportamiento geohidrológico mediante imágenes Landsat 8 y aproximación al estado microbiológico de sus aguas

Autor: María Cabañero Recuero
Tutores: Silvia Martínez Pérez y Antonio Sastre Merlin
Asesor Técnico: José Antonio Domínguez Gómez.

2014

El humedal de las Lagunas de Puebla de Beleña:
Seguimiento de su comportamiento geohidrológico mediante imágenes Landsat 8 y aproximación al estado microbiológico de sus aguas.



María Cabañero Recuero

Tutores: Silvia Martínez y Antonio Sastre

6.- CONCLUSIÓN



Proyecto de I+D INTELECTA

<http://www.zumain.es/>

Muestreo 29 Octubre 2014



6.- CONCLUSIÓN



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NOW

Project Acronym (+link to description)	Project type	Name of lead scientist (+link to ID card)	Aircraft required	Instrument required	History file	Campaign planned dates	Status
---	--------------	--	-------------------	---------------------	--------------	------------------------	--------

AIRES-CZM EUFAR Project

HYPERSPECTRAL AISA-EAGLE IMAGES (18/07/2010)



PI: Dra Elena Castillo (elena.castillo@unican.es)

6.- CONCLUSIÓN



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Remote Sensing as a tool for the management of Spanish Aquatic Ecosystems

FUTURE



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- [Three ESA Earth science missions move to next phase](#)

In depth

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Space for our climate

TWO NEW EARTH OBSERVATION MISSIONS CHOSEN FOR FURTHER STUDY



26 November 2010 As part of the procedure to realise ESA's series of Earth Explorers, two new mission proposals have been selected for further development. The missions, called FLEX and CarbonSat, now vying to be the eighth Earth Explorer, both address key climate and environmental change issues.

The selection follows ESA's Call for Earth Explorer Proposals that was released in October last year and ended in the Agency receiving 31 high-quality mission concepts. Subsequently, the proposals were carefully evaluated by leading Earth scientists in four peer review panels.

This evaluation process, which included a

EO programmes

- [The Living Planet](#)
- [Copernicus](#)

ESA's Earth Observing missions

- [Envisat](#)
- [ERS overview](#)
- [Earth Explorers overview](#)
- [Sentinels overview](#)
- [Proba-V](#)
- [Proba-1 overview](#)
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6.- CONCLUSIÓN

https://earth.esa.int/web/guest/missions/esa-future-missions/sentinel-3



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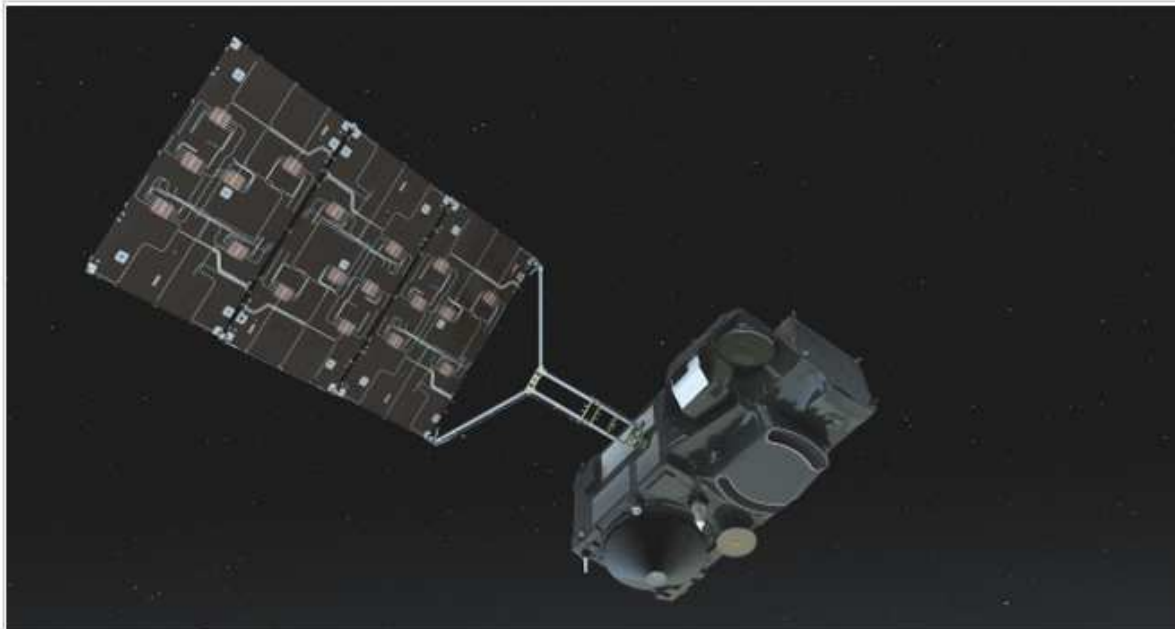
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Sentinel 5P

Earth Explorers

3rd Party Missions

ESA Earth Observation Campaigns Data

ESA/EUMETSAT

ESA Mission Continuity

ESA Mission News

ESA User Services News

Documentation

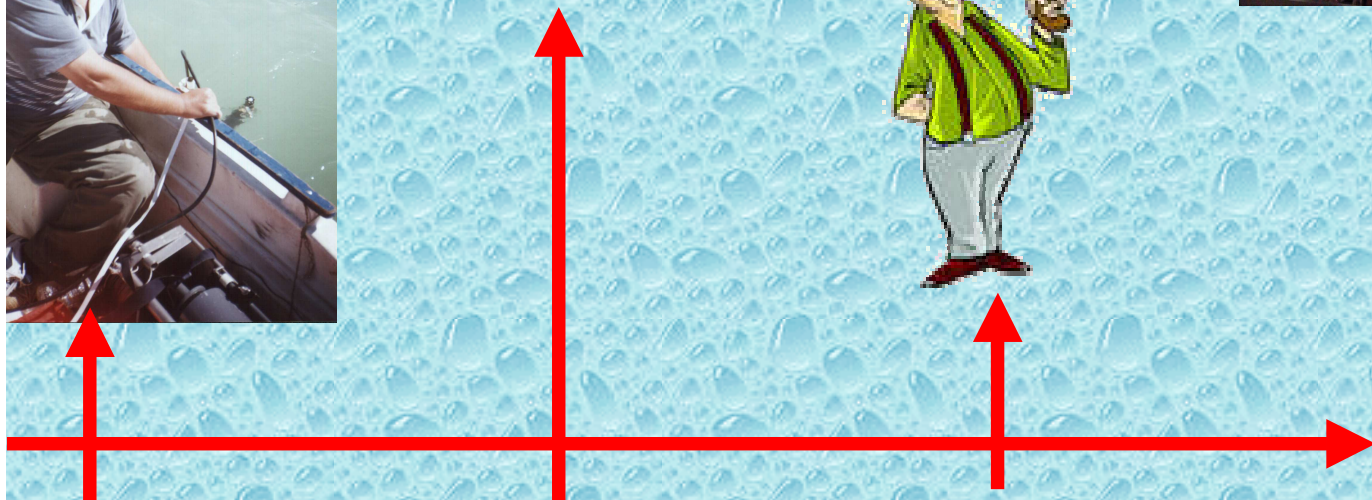
6.- CONCLUSIÓN



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